



MARLOW-HUNTER, LLC

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# *Operator's Manual*

*MH31*





*Thank You!*  
*From the Marlow-Hunter Team*

*Dear Marlow-Hunter Owner,*

*Congratulations and welcome to the Marlow family! As a Marlow-Hunter owner, you will enjoy the quality and the attention to detail for which Marlow boats are renowned. The Marlow organization and your dealer are committed to your service and total satisfaction.*

*This Operator's Manual will acquaint you with the proper operation and maintenance of your new Marlow-Hunter, whether in port or at sea, with a heavy emphasis on boating safety, our primary concern.*

*The new boat Warranty Registration Form you signed at the time of delivery will be sent to us by your dealer. This registration begins the two year warranty and establishes your contact information in our system.*

*As you already know, we work with the highest quality equipment manufacturers to supply various components installed on your boat. To receive full warranty coverage on all the individual components, such as engines, electronics and appliances, be sure to also complete their registration process. Most, if not all, manufacturers provide online registration. As an alternative, complete and return the respective manufacturer's warranty cards included in your digital or hard copy owner's manual packet. Please remember all the information contained in the OEM (Original Equipment Manufacturer) manuals supersedes the information contained in this manual.*

*Finally, if you are new to boating, be certain to learn the proper rules of seamanship to ensure the safety of your passengers. We recommend reading books such as Chapman's Piloting, Seamanship and Small-Boat Seamanship Manual for useful information concerning this aspect of boating. Attend a safe boating course offered by the United States Coast Guard Auxiliary, United States Power Squadron, or any enterprise experienced in conducting safe boating courses.*

*Thank you for choosing Marlow-Hunter. We are confident your new boat will provide you and your family with years of enjoyable boating.*

*The Marlow-Hunter Team,  
Marlow-Hunter, LLC*

# Welcome to the Marlow-Hunter Family

## A Proud Heritage / A Strong Future

Marlow-Hunter carries on from one of America's oldest privately held boating companies. In August 2012, Hunter Marine Corporation became Marlow-Hunter, LLC and is continuing the great tradition started more than 40 years ago. David Marlow, owner and founder of Marlow Yachts, has stepped into leadership for the Hunter line of sailboats and the reintroduction of the Mainship line of cruisers. As a result, Marlow-Hunter benefits both from decades of his personal experience, common sense, drive for excellence, understanding of the customer and love for all things boating as well as decades of craftsmanship, innovation and dedication of an existing production team. We are excited about the future and the opportunity to continue the heritage of Hunter and to produce each new boat better than the last.

## Your New Hunter

Your new Marlow-Hunter 31 stands alone in its class. Nothing compares to its elegance, comfort, convenience and ease of handling. Conceptually, we have taken the required and desired from the past and melded it with tomorrow and sprinkled the whole with style. Specifically, our design, engineering, manufacturing and service teams are united in pride to provide you the rich pleasure of Hunter ownership. Every feature, every piece of equipment and its placement has been engineered to provide you the best advantage on the water. Your Marlow-Hunter 31 is a gem.

## How to Use this Manual

We suggest initially reading your operator's manual from beginning to end when you first receive your new boat. By doing this, you will gain a quick overall perspective of your boat's features and controls as well as a basis for locating more detailed and specific information. This manual weaves together words, drawings and pictures to convey the clearest understanding of the components of your new Marlow-Hunter.

## Table of Contents & Glossary

For quick reference, a table of contents is located in the beginning of this manual and references specific page numbers for the concepts, instructions and reference material. Also, a glossary is located in the final portion of this manual to clarify any unfamiliar terms.

## Safety Warnings and Symbols

Your safety is our highest priority. Please carefully read the Boating Safety chapter in this manual. In it, you will find an explanation of the caution, warning, and danger symbols used throughout the manual. These symbols highlight situations that are potentially harmful and provide helpful information for safe boating.

**For questions regarding your Marlow-Hunter or this manual, contact Customer Service at:**

Marlow-Hunter, LLC  
Route 441, Post Office Box 1030  
Alachua, FL. USA 32616  
Phone: (386) 462-3077  
Fax: (386) 462-4077  
e-mail: [aftersales@marlow-hunter.com](mailto:aftersales@marlow-hunter.com)  
(8am to 5pm EST) 1-800-771-5556



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**2. Documents and Forms**

**3. Warranty**

**4. Boating Safety**

**5. Fuel System**

**6. Underwater Gear**

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MARLOW-HUNTER, LLC

*Chapter 1*

# *Introduction*

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To convey a basic introduction to your boat, this chapter is organized into the following sections:

1. The Manual Packet
2. Owner/Operator Responsibilities
3. Dealer's Responsibilities
4. Additional Sources of Information
5. Original Equipment Manufacturers' (OEM) Manuals
6. Hull Identification Number
7. Manufacturer's Certifications
8. Service, Parts and Repair

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### 1.1 The Manual Packet

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This Operator's Manual, along with the OEM (Original Equipment Manufacturers) manuals, is provided to assist you in operating your boat and using its various systems and equipment safely. It provides:

- Basic safety information
- Descriptions of many of your boat's features
- Explanations of the equipment on your boat
- The fundamentals on the use of that equipment
- The fundamentals on the use of your boat.

This Operator's Manual provides various drawings and technical documentation to assist in locating your boat's devices and equipment. **However, please note that while every effort is made to maintain consistency between these technical references and production, efforts to improve the vessel designs may date some of the information found herein.**

The information found in this Operator's Manual may only summarize more detailed information found elsewhere in the OEM manuals. These summaries are intended to be a convenient reference for daily use. OEM manuals take precedence over the information found in this Operator's Manual.

This manual is not intended to provide a course in boating safety, navigation, anchoring or docking your boat. Generally speaking, operating a boat requires more skill, knowledge and awareness than what is necessary to operate a car or truck. Consequently, responsible boat operators should pursue all avenues necessary to become knowledgeable and experienced in all facets of boat ownership and operational safety.

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### 1.2 Owner/Operator Responsibilities

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Whether in digital or hard copy format, please keep this manual in a dry, secure and readily accessible location on your boat at all times! Transfer it to the new owner if you decide to sell the boat.

Whether this is your first boat or an unfamiliar model, please insure that you obtain handling and operating experience before assuming command. For your safety and the safety of your passengers, you must:

- Take a course in Boating Safety;
- Get instruction or aid in the safe and proper handling of your boat;
- Familiarize yourself and your passengers of the locations and use of all safety and essential operating equipment.
- Understand and follow the rules of the waterways.
- Learn how to navigate a boat in all sea and weather conditions;
- Register your boat. Contact state boating authorities or your dealer for registration requirements.

Boating Safety courses provide owners and operators with the opportunity to gain knowledge and experience in a variety of skills:

- Navigation
- Seamanship and boat handling
- Rules of the Waterway
- Knowledge of federal, state, and local regulations
- Weather prediction
- Safety at sea
- Survival in bad weather
- Respect for others on the water
- First aid
- Radio communication
- Distress signals
- Rendering assistance to others
- Use of lifesaving equipment
- Pollution control
- Knowledge of the boat and its systems
- Seaworthiness
- Leaving or approaching a dock mooring
- Anchoring and weighing anchor

- Beaching/shallow water operations
- Towing/being towed
- Handling mooring lines and tying up
- Procedures for emergencies including fire, flooding, collision, medical emergencies, etc.

Be aware, even though your boat is categorized properly, the sea and wind conditions corresponding to the design categories A, B, or C (as set by the Recreational Craft Directive) (see Fig. 1.1) can range from strong gale to severe conditions where only a competent, fit and trained crew handling a well maintained boat can safely operate.

### DESIGN CATEGORIES

Sea and wind conditions for which a boat is assessed by the International Standard to be suitable, provided the craft is correctly handled in the sense of good seamanship and operated at a speed appropriate to the prevailing sea state.

#### Design Category A ("ocean")

Category of boats considered suitable to operate in seas with significant wave heights above 4 m and wind speeds in excess of Beaufort Force 8, but excluding abnormal conditions, e.g. hurricanes.

#### Design Category B ("coastal")

Category of boats considered suitable to operate in seas with significant wave heights up to 4 m and winds of Beaufort Force 8 or less

#### Design Category C ("inshore")

Category of boats considered suitable to operate in seas with significant wave heights up to 2 m and a typical steady wind force of Beaufort Force 6 or less.

#### Design Category D ("sheltered waters")

Category of boats considered suitable to operate in waters with significant wave heights up to and including 0,30 m with occasional waves of 0,5 m height, for example from passing vessels, and a typical steady wind force of Beaufort 4 or less.

REF: EN ISO 12217

Figure 1.1

Finally, we welcome your comments or suggestions concerning this manual. Did you find the information helpful? Was the information delivered in a clear and precise manner? Was the information thorough enough to help you with your new boat? Please contact Customer Service at [aftersales@marlow-hunter.com](mailto:aftersales@marlow-hunter.com) if you have any questions or comments.

## 1.3 Dealer's Responsibilities

In addition to conducting a pre-delivery check and service of your boat, your dealer should provide:

1. A description and demonstration of the safety systems, features, instruments, and controls of your boat;
2. An orientation in the general operation and mechanical systems of your boat;
3. A copy of the Product Delivery Service Record form completed by you and the dealer during your inspection of the boat;
4. A review of all warranty information and how to obtain warranty service;
5. A complete set of owner's manuals (digital or hard copy).

If you do not receive these materials, forms, or information, or you have any questions, contact your dealer or Marlow-Hunter at [www.marlow-hunter.com](http://www.marlow-hunter.com).

## 1.4 Additional Sources of Information

In North America, contact one of the following for information on boating courses:

- U.S. Coast Guard Auxiliary
- U.S. Power Squadron
- Canadian Power and Sail Squadrons
- Red Cross
- State Boating Offices

- Yacht Clubs
- Boat U.S. Foundation

Outside of North America, contact your dealer, or your government boating agency for assistance.

Marlow-Hunter is pleased to supply you with; and strongly recommends that you read the following:

Piloting and Seamanship  
(Chapman)  
Motor Yacht and Sailing  
P.O. Box 2319, FDR Station  
New York , NY 10002

Additionally, Marlow-Hunter recommends that you purchase and read the following:

Yachtsman Handbook  
by Tom Bottomly  
Motor Yacht and Sailing  
P.O. Box 2319, FDR Station  
New York, NY 10002

The Complete Book of Boat Maintenance and Repair  
by Dave Kendall  
Doubleday and Co.  
Garden City, NY 11530

Pleasure Yachting and Seamanship  
U.S. Coast Guard Auxiliary  
306 Wilson Road Oaklands  
Newark, DE 19711

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### 1.5 Original Equipment Manufacturers' (OEM) Manuals

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Marlow-Hunters feature various pieces of equipment and components from other manufacturers installed on your boat. Examples include engines, pumps, generators, etc. Most OEMs provide operation and maintenance manuals for your boat's equipment. Keep OEM manuals together with your Hunter Operator's Manual in a safe and accessible place. Be sure to transfer them to the new owner if you sell your boat.

*NOTE: If information in this Operator's Manual differs from that found in the OEM manuals, the OEM manuals take precedence.*

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### 1.6 Warranties

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For U.S. and non-EU compliant countries, your Marlow-Hunter warranty info can be found in the Limited Warranty chapter in this manual.

For international owner's, your Marlow-Hunter warranty can be found in your CE compliant Owner's Manual.

Nearly all OEM equipment has its own limited warranty. Warranty information and registration procedures for these components are found on the manufacturer's websites or OEM manuals digitally included with Marlow-Hunter's digital Operator's Manual. Locate and read these individual warranties and organize them for easy, future reference.

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### 1.7 Hull Identification Number (HIN)

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The "Hull Identification Number", located on the starboard aft side of your boat, is the most important identifying factor of your boat and must be included in all correspondence, orders and warranty claims. Failure to include this information creates delays.

Hull Number Format: US-MHLYYXXDXZZ

"US" - country origin, "MHL" - Manufacturer, "YY" - model number, "XXX" - hull number, "D" - manufacture start month code, "X" - manufacture year code, "ZZ" - model year

Also of importance are the engine part numbers and serial numbers. When corresponding or ordering parts, please include these numbers in your communications. Refer to the engine OEM manuals for serial number locations and record them for future reference.

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### 1.8 Manufacturer's Certifications

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As a boat manufacturer, Marlow-Hunter builds our products to the guidelines established under the Federal Boat Safety Act of 1971. This act was promulgated by the U.S. Coast Guard having the authority to enforce such guidelines on boat manufacturers selling products in the United States. Marlow-Hunter ensures that all of its products comply with these guidelines.

The National Marine Manufacturers Association (NMMA)

provides Marlow-Hunter with a third party certification. The NMMA is an organization that represents the marine industry and assists manufacturers, boat dealers, marinas, repair yards and component suppliers in areas of legislation, environmental concerns, marine business growth, and state and federal government agency interaction. The third party certification that Marlow-Hunter participates in, uses well known Standards and Recommended Practices of the ABYC, American Boat and Yacht Council.

We at Marlow-Hunter participate extensively in the ABYC, which is all non-profit, and develops and publishes voluntary standards and recommended practices for boat and equipment design, construction, service and repair. We utilize all applicable ABYC standards in the construction of Hunter boats.

Finally Marlow-Hunter sells their products worldwide, and as such must conform to the various rules and regulations required by other countries. Most notably are the European ISO (International Organization for Standardization) standards which require the application of the CE (Common European) mark. This mark, much like the NMMA certification here in the U.S., gives you, the boat owner, specific information concerning your boat.

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### 1.9 Service, Parts and Repair

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When your boat needs service, parts, or repair, contact your dealer or Customer Service at Marlow-Hunter at [aftersales@marlow-hunter.com](mailto:aftersales@marlow-hunter.com) to find a service/parts location. To locate repair and parts facilities for the OEM equipment installed on your boat, refer to the respective OEM manual for that component.

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal black lines across its entire width, typical of notebook or legal stationery. The background is a solid off-white color, and there are no margins, text, or other markings present.

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MARLOW-HUNTER, LLC

*Chapter 2*

***Documents  
and  
Forms***

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This chapter introduces and includes the following documents and forms that will be important in the ownership and operation of your vessel:

1. Pre-Delivery Service Record
2. Vessel Information Form
3. Preliminary Care and Maintenance Checklist
4. Float Plan
5. USCG Recreational Boating Accident Report
6. Vessel Inventory Forms
7. Miscellaneous Forms

Many of these forms contain lists of items and recommendations that we believe should be incorporated into your own ongoing list of preventative maintenance items and safety check points. **THIS LIST SHOULD NOT BE CONSIDERED A COMPLETE SERVICE MANUAL OR THE ONLY ITEMS ON YOUR BOAT IN NEED OF ROUTINE MAINTENANCE, INSPECTION OR ATTENTION.**

You will find that we address commonly found optional equipment items installed on Hunter boats, as well as most standard equipment from Marlow-Hunter. Owner's need to familiarize themselves with individual equipment manuals on all such items, especially aftermarket purchases or optional equipment installed by your dealer or Marlow-Hunter. This should insure that you are following the manufacturer's recommendations for proper maintenance and up-keep.

Again, to reemphasize, we strongly recommend that all owners complete a Power Squadron course followed with a complementary boat inspection before leaving the dock. To locate a Power Squadron in your area please visit [www.usps.org](http://www.usps.org).

In addition, reviewing and familiarizing yourself with the Chapman's Piloting Manual is also highly recommended for every boat owner. This manual contains demonstrations for safety drills which should be practiced routinely, dealing with adverse conditions, general boat handling and recommended safety equipment. Our opinion is that no boat owner should operate a boat without first reviewing this manual and without having ready access to it while boating.

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### 2.1 Pre-Delivery Service Record

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Your Marlow-Hunter dealer will complete a Pre-Delivery

Service Record form (**Fig. 2.1**) before you take delivery of your boat. It is the dealer's responsibility to both you and Marlow-Hunter to give your boat a final inspection prior to delivery. The purpose of this inspection is to assure proper adjustment and operation of the entire vessel. Your dealer should provide you and Marlow-Hunter a copy of the Pre-Delivery Inspection Report at the time of delivery. Store this document in a safe place. Do not keep it aboard your boat.

If this form is not fully completed, Marlow-Hunter will not pay warranty costs (see the Warranty chapter in this operator's manual for further information) for items that should have been covered in the pre-delivery service inspection and recorded on the Pre-Delivery Inspection Report.

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### 2.2 Vessel Information Form

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This form (Fig. 2.2) is convenient for helping to identify specific information regarding your boat. We recommend you place a copy on the boat and another ashore allowing quick reference.

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### 2.3 Preliminary Care and Maintenance Checklist

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Use these checklists (Fig. 2.3) to help you cover the various facets of operating your boat. These checklists will help you standardize and familiarize your review of your boat's equipment and components and provide the basis for an enjoyable and safe boating experience.

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### 2.4 Float Plan

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This form (Fig. 2.4) is useful by providing a record of your destination, departure and return times, boat description, passenger list, and other information about the trip you have planned. At the bottom of the form is space for listing emergency phone numbers in case your return is delayed past the expected time. It also has space for indicating information about the person filling the report. Leave the completed form ashore with a responsible person. We recommend you make several copies of this form each boating season to make sure you have a good supply.

forms; they can be very useful.

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### 2.5 USCG Recreational Boating Accident Report

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No one likes to think about having a boating accident, but boating accidents do happen. You must file an accident report (Fig. 2.5) after a boating accident just as you must file an accident report after an automobile accident.

You must file this report with the U.S. Coast Guard within 10 days if boat or property damage totals \$2,000 or more and within 48 hours if an accident results in one of the following:

1. Death
2. A person disappears
3. Personal injury requiring medical treatment beyond first aid

State statutes determine whether you must file an accident report in this case. An accident report must be filed if the damage exceeds a threshold dollar value as established by the states; the threshold is generally \$100-\$200. Refer to Boating Safety Resource Center at [www.uscgboating.org](http://www.uscgboating.org) to verify the threshold for a particular state.

*NOTE: State and local agencies may also have accident reporting requirements. Check with local enforcement agencies or with your dealer regarding local requirements.*

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### 2.6 Vessel Inventory Forms

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These forms (Fig. 2.6) are itemized to help organize and document your gear and equipment. Forms exist for emergency equipment, spare parts, light bulbs and general listing.

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### 2.7 Miscellaneous Forms

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Finally, inserted at the end of this section are several documents (Fig. 2.7) you may find helpful. These sample forms are designed to help your organization in dealing with your new boat. Please familiarize yourself with these

## Documents and Forms

### MARLOW-HUNTER, LLC P.O. BOX 1030 – ALACHUA, FL 32616

### PRE-DELIVERY SERVICE RECORD

**IMPORTANT:** This completed report is required for processing of claims for warranty adjustment. Please forward immediately.

DEALER NAME			OWNER NAME		
ADDRESS			ADDRESS		
CITY	STATE/ZIP		CITY	STATE/ZIP	
HULL #	YEAR	SIZE	ENG #	ENGINE MAKE	

#### BEFORE LAUNCH PROCEDURE:

	DEALER	OWNER
1. Prop Size _____ Shaft Size _____	_____	_____
2. Prop Rotation _____	_____	_____
3. Prop installed property with cotter pin in shaft	_____	_____
4. Shaft turns freely	_____	_____
5. Shaft aligned in shaft log tube	_____	_____
6. Shaft alignment in relation to strut	_____	_____
7. Engine intake thru hull clear and installed properly	_____	_____
8. Pet-cocks closed on engine	_____	_____
9. Rudder swings freely – no binding or hard spots (check with wheel)	_____	_____
10. Emergency tiller steering system, complete operational check with owner	_____	_____
11. Primary steering system, complete operational check	_____	_____
12. Cockpit seat hatches lift smoothly	_____	_____
13. Companionway sliding hatch and door works smoothly	_____	_____
14. Check keel bolts for tightness	_____	_____
15. Hook up and tighten battery cables	_____	_____
16. Check hose clamps on engine pickup, engine exhaust, vanity drain, galley drain, fresh water system, toilet hoses and bilge pump – A/C – genset	_____	_____
17. Electrical equipment operational: ( ) Running lights ( ) Cabin lights ( ) Anchor light ( ) Steaming light ( ) Stern light ( ) Courtesy lights	_____	_____
18. Check bilge pumping system – operational	_____	_____
19. VHF radio operational	_____	_____
20. Mast wire tube properly sealed	_____	_____
21. Check optional dripless packing spring tension & set screws	_____	_____

#### BOAT IN WATER:

22. Check for leaks: rudder post, shaft log, stuffing box, strut bolts and keel bolts	_____	_____
23. Check for thru-hull fitting leaks: engine pickup, galley sink drain, toilet pickup, toilet discharge, knot/depth, A/C, refrigerator	_____	_____
24. Check windows and deck hardware for leaks	_____	_____
25. Check opening ports and hatches for leaks	_____	_____
26. Check rub rail and deck joints for leaks	_____	_____
27. 110 dockside cord and receptacles OK	_____	_____
28. Toilet operates OK, intake open, outlet open, pumps OK	_____	_____
29. Pressure water system operates OK (let pressure stand for 15 minutes to see if pump goes on)	_____	_____
30. Hot water heater operation OK	_____	_____
31. Check stove system for leaks per manufacturer's instructions	_____	_____
32. With fuel tank full, no leaks at fill pipe, overflow vent or any fuel line connections or gauge	_____	_____
33. Drawers work smoothly	_____	_____
34. Doors work smoothly	_____	_____
35. Engine aligned .004 or less	_____	_____
36. Check and tighten all engine mount attachments	_____	_____
37. Check and tighten all engine flange and coupling bolts	_____	_____

#### BEFORE STARTING ENGINE:

38. Throttle control cable travel and brackets OK	_____	_____
39. Clutch control cable travel and brackets OK	_____	_____
40. Crank case oil level at full mark	_____	_____
41. Transmission oil level at full mark	_____	_____
42. Engine shut off OK	_____	_____
43. Engine water pickup OK	_____	_____
44. Bleed air out of fuel line	_____	_____
45. Check heat exchanger fluid level and overflow bottle	_____	_____

#### AFTER STARTING ENGINE:

	DEALER	OWNER
46. Oil pressure OK	_____	_____
47. Water flow out of exhaust	_____	_____
48. Check fuel line connections for leaks	_____	_____
49. No engine water or oil leaks	_____	_____
50. Idling speed OK, Max RPM OK	_____	_____
51. Gear shifts work properly – forward, reverse, neutral	_____	_____
52. Instruments register properly	_____	_____
53. Check stuffing box drip rate (3-4/minute)	_____	_____
54. Purge optional dripless packing assembly	_____	_____
55. Hour meter reading properly	_____	_____

#### OPTIONAL GENERATOR ENGINE:

56. Crank case oil level at full mark	_____	_____
57. Engine water pickup open	_____	_____
58. Check heat exchanger fluid level and overflow bottle if supplied	_____	_____
59. Bleed air out of line	_____	_____
60. Check flow out exhaust	_____	_____
61. Hour meter reading properly	_____	_____

#### RIGGING:

62. Mast steaming light OK	_____	_____
63. Spreaders properly secured	_____	_____
64. Shrouds and stays right length	_____	_____
65. Main and jib halyards right length	_____	_____
66. Jib fits properly	_____	_____
67. Main fits and operates properly	_____	_____
68. Topping lift, out haul, reefing system installed properly	_____	_____
69. Install windex	_____	_____
70. Main sheet and blocks OK	_____	_____
71. Jib sheet and blocks OK	_____	_____
72. Winch handles fit and winches smooth	_____	_____
73. Rigging properly tuned and pinned	_____	_____
74. Furling system operational	_____	_____
75. Traveler arch ground wire installed	_____	_____

#### FINAL CHECK:

76. All accessory equipment on board	_____	_____
77. All loose gear on board	_____	_____
78. Owner's manual on board	_____	_____
79. Warranty registration form completed and signed	_____	_____
80. Owner familiarized with operation and warranty policy	_____	_____
81. Boat properly cleaned, interior and exterior	_____	_____
82. Owner advised to complete component warranty cards	_____	_____
83. All plexiglass hatches and ports free of scratches	_____	_____
84. All interior wood free of dents, dings and scratches	_____	_____
85. Interior cushions, bedding & curtains clean and free of defects	_____	_____
86. Exterior gelcoat free of defects	_____	_____
87. Fee of water intrusion above and below the water line	_____	_____
88. All electronic equipment calibrated and operational	_____	_____
89. Exterior wood free of defects	_____	_____
90. Life lines adjusted and secure	_____	_____

Dealer Signature: \_\_\_\_\_ Date: \_\_\_\_\_

I have received, read and understand completely the Marlow-Hunter Limited Warranty for my boat.

Owner Signature: \_\_\_\_\_ Date: \_\_\_\_\_

DEALER COMMENTS (Refer to check list by item #)

Remove 2<sup>nd</sup> & 3<sup>rd</sup> Copies and Forward Form Intact.

DISTRIBUTION: Original – Marlow-Hunter Service Dept., Canary – Owner, Pink – Dealer  
FORM #300-16/0112

## Documents and Forms

### VESSEL INFORMATION

Name		Hailing Port	
I.D. Number		Radio Call Signal	
Owner's Name		Telephone Number (     )	
Address			
Builder		Model	
Year	Length	Draft	Beam
Height	Weight	Hull Color	Trim Color
Propeller Size(s)		Rotation	
Vessel Construction Material			
Engine Make(s)		Engine Model(s)	
Serial Number(s)		Number of Cylinders (per)	
Oil Type Winter		Summer	Capacity
Fuel Tank(s) Capacity		Water Tank(s) Capacity	
Waste Tank Capacity		LPG Gas Capacity	
Hot Water Tank Capacity		Generator Make/Model	Generator Oil Capacity
Transmission Type	Transmission Model		Transmission Fluid/Oil Capacity
Steering Type	Steering Model		Steering Fluid/Oil Capacity
Insurance Company		Telephone Number (     )	
Address			
Policy Number		Agent	

## Preliminary care and maintenance checklist

***Some items listed below pertain to optional equipment and may or may not be applicable on your boat. A qualified Technician should be used if you are not completely confident in your ability to make repairs or inspections.***

### Out of Water Inspection

#### Pre-launch inspection

- ☐ Sacrificial zinc anodes installed (if applicable)
  - ☐ Propeller installed with keyway, nuts and cotter pin
  - ☐ Propeller shaft turns freely and without excess wobble (if applicable)
  - ☐ Strut and shaft log free of corrosion (if applicable)
  - ☐ Rudder swings easily & correct with wheel direction
  - ☐ Rudder and post inspected for cracks and/or concealed damage (may require removing rudder)
  - ☐ Auxiliary tiller handle properly aligned, fits securely and operational
  - ☐ All thru-hulls and valves below water line inspected for corrosion, labeled and closed until after launch
  - ☐ Bottom paint in satisfactory condition
  - ☐ Hull freshly cleaned and waxed (free of gelcoat damage)
  - ☐ Mooring, safety lines and fenders onboard and in good condition
  - ☐ House & engine start batteries installed and filled with correct electrolyte levels
  - ☐ House & engine start battery boxes secured
  - ☐ All battery terminals clean and wires secured
  - ☐ Engine block & transmission drains closed
  - ☐ Transducer in place
  - ☐ Hose clamps on all systems below water line tight
  - ☐ Keel bolts tight and clean
  - ☐ Exhaust hose attached and secured
  - ☐ Boat is free of internal and external water leaks above water line
- (Failure to stop water intrusion could result in permanent damage or deterioration of structural coring materials and internal wiring and cause mildew and molding)

#### Mast Assembly

- ☐ Review manufacturer's manual for operation and maintenance
- ☐ Spreaders securely fastened
- ☐ Mast and spreaders free of corrosion and stress cracks
- ☐ Standing rigging and pins inspected for wear, tear, corrosion and cracking
- ☐ External wiring secured for anchor, steaming and deck lights
- ☐ Electronic wind indicator installed per manufacturers recommendation (if applicable)
- ☐ Manual wind indicator installed on masthead
- ☐ VHF antenna installed and connected
- ☐ Headsail furling system installed and inspected per manufacturer's recommendation
- ☐ Running rigging inspected for wear and tear
- ☐ Mast step stand-up blocks secured and operational
- ☐ Mainsail, jib sail and flaking system inspected for wear and tear (non-furling mast).
- ☐ In- mast system checked for smooth operation and overall condition of sails
- ☐ Specified pre-bend and diagonal tensions attained in mast
- ☐ Mast to deck wiring properly sealed with drip loop

### Anchor System and Ground Tackle

- ☐ Anchor windlass (option) inspected per manufacturer's recommendation
- ☐ Anchor secured in bow roller assembly
- ☐ Spare anchor onboard and accessible (owner purchased)  
(See Chapman's Manual for recommendations on anchors, anchor lines and drogues)
- ☐ Anchor line pays out and retrieves into anchor line storage without difficulty
- ☐ Bitter end of anchor line secured
- ☐ Anchor rode inspected and free of abrasions
- ☐ Anchor chain shackle is corrosion free and lock-wired at pin after secured to anchor
- ☐ Anchor locker drain is unplugged

### Fuel System

- ☐ Tank fuel level indicator functioning properly
- ☐ Fuel clean and treated with engine manufacturer's recommended additives
- ☐ Primary and secondary (on engine) filters cleaned or replaced
- ☐ Fuel tank supply valves open
- ☐ Fuel tank vent clear from tank to atmosphere (hose has anti-siphoned loop in place at hull or deck side)

### Steering System

- ☐ Inspect and service steering system according to manufacturer's recommendation
- ☐ Ensure the autopilot drive is not wet or exposed to water
- ☐ Clean and grease autopilot motor swivel joint
- ☐ Ensure compass light is operational

### Primary Pumps Functional

- ☐ Electric bilge pumps and float switches (discharge hose has anti-siphon loop in place to prevent back flow)
- ☐ Fresh water pump
- ☐ Toilet flush pump
- ☐ Shower sump pump
- ☐ High water bilge alarm pump
- ☐ Manual bilge pump

### Illumination and small electrical components check

- ☐ Bow light
- ☐ Cabin lights
- ☐ Stern light
- ☐ Deck light
- ☐ Instrument lamps
- ☐ Masthead light
- ☐ Anchor light
- ☐ Cockpit storage courtesy light
- ☐ Chart light
- ☐ Reading lights
- ☐ Distribution panel lights
- ☐ Smoke detectors operational

- \_\_\_ CO detectors operational
- \_\_\_ Engine compartment blower operational
- \_\_\_ Auto fire suppression system operational (engine compartment)
- \_\_\_ Shore power cord and adapter plug operational. (See manufacturer's manual for complete details.)
- \_\_\_ 110 or 220 VAC outlets operational - ground fault circuits functioning
- \_\_\_ 110 or 220 VAC inverter/battery charging systems functioning properly

### Fresh Water Systems

- \_\_\_ Hot water heater drain shut
- \_\_\_ All spigots and hose bibs shut
- \_\_\_ All tank(s) flushed clean and free of debris and antifreeze
- \_\_\_ Water heater tank and lines flushed of antifreeze
- \_\_\_ All water lines and components purged of air and checked for leaks
- \_\_\_ Sinks and drains checked for leaks and adequate flow
- \_\_\_ Cockpit shower operational
- \_\_\_ Fresh water filters clean
- \_\_\_ Tank water level indicator systems operating- labeling and tank valve selection correspond

### Head and Holding Tank Systems

- \_\_\_ Vent clear from tank to atmosphere
- \_\_\_ Filled with fresh water (electric head)
- \_\_\_ Toilets flush to holding tanks properly
- \_\_\_ Waste level indicating system properly functioning
- \_\_\_ No leaks at any hose fitting within the system

### Galley Systems

- \_\_\_ Stovetop or oven operational (Refer to manufacturer's manual for proper operation and trouble shooting.)
- \_\_\_ Gimbal latch secure and operational
- \_\_\_ Microwave operational
- \_\_\_ Refrigerator operational and proper temperature attained
- \_\_\_ Freezer operational and proper temperature attained
- \_\_\_ Icebox drains properly
- \_\_\_ Icebox drain plugs installed
- \_\_\_ USCG waste disposal-warning poster onboard or in owner's package
- \_\_\_ LPG tank filled, installed and connected to regulator; inspect Gas system for leaks after 3 minutes  
(Should a leak be detected immediately close the main valve exit boat and seek professional assistance for a thorough inspection.)
- \_\_\_ LPG storage locker drain open and tank storage area free of debris

### Topside Inspection

- \_\_\_ Swim platform operates properly
- \_\_\_ Cockpit cushions cleaned and installed
- \_\_\_ Canvas properly cleaned and installed
- \_\_\_ Rubrail properly secured to hull
- \_\_\_ Load bearing hardware securely fastened; this includes but is not limited to cleats and handrails
- \_\_\_ Lifeline fittings tight and secure
- \_\_\_ Sliding hatch drains free of debris

## Documents and Forms

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- \_\_\_ Companionway drop-ins fit properly in companionway and storage rack
- \_\_\_ Plexiglas hatches and ports adjusted and cleaned.  
(Cleaners and polishers specifically for Plexiglas can be purchased from most marine supply stores.)
- \_\_\_ Traveler arch securely fastened and grounded
- \_\_\_ Hatches, ports, windscreens and windows adjusted and cleaned
- \_\_\_ External teak cleaned and oiled (Teak decking cleaned with mild soap and water.)
- \_\_\_ External railings cleaned with soap and water then hand polished using automotive wax
- \_\_\_ All deck fill caps sealed properly and have retainer chains intact (except Waste Pump-out)
- \_\_\_ Dorade vents or sealing caps installed
- \_\_\_ Topsides surface clean and free of gelcoat damage

### Interior Inspection

- \_\_\_ Drop-in hatches (bunk and floors) in place and fit securely
- \_\_\_ Interior steps and grab rails secured
- \_\_\_ Bilges clean and free of debris
- \_\_\_ Opening port and hatch screens in place
- \_\_\_ Blinds / privacy curtains, shades and interior cushions cleaned, installed and secured
- \_\_\_ Head door opens, shuts and latches properly
- \_\_\_ Ensure all wires and connection on distribution panels are tight (should be professionally inspected)
- \_\_\_ Television / DVD operational
- \_\_\_ Stereo / CD operational
- \_\_\_ Chapman's Manual onboard and readily available
- \_\_\_ Safety gear onboard readily available and up to date.  
(See Chapman's Manual and US Coast Guard website at < [www.uscg.mil](http://www.uscg.mil) >for details.)
- \_\_\_ Boat operator's manual / OEM manuals onboard

## In Water Inspection

### Dockside inspection of Engine, pre-start sequence and operating system

- \_\_\_ Review engine manual for maintenance requirements and proper starting procedure
- \_\_\_ All engine mounting bolts in place and properly torque (per engine manual)
- \_\_\_ Crankcase oil at full mark (per engine manual)
- \_\_\_ Transmission fluid / oil at full mark (per engine manual)
- \_\_\_ Coolant mix ratio proper - heat exchanger and expansion tanks full (per engine manual)
- \_\_\_ Seawater intake valve open and no leaks
- \_\_\_ Air bled from fuel lines and system
- \_\_\_ No fuel leaks at any fittings
- \_\_\_ Throttle linkages smooth and operational
- \_\_\_ Shutdown system operational
- \_\_\_ USCG Oil Discharge warning poster in place
- \_\_\_ Exhaust elbows and hoses tight
- \_\_\_ Starting sequence and alarms correct
- \_\_\_ Oil pressure acceptable (per engine manual)
- \_\_\_ Coolant temperature acceptable (per engine manual)
- \_\_\_ Alternator DC output at rated rpm (per engine manual)
- \_\_\_ Correct idle rpm (per engine manual)
- \_\_\_ Water discharged with exhaust
- \_\_\_ Hour meter operational



## Documents and Forms

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- ☐ Fuel level indicators operational
- ☐ Throttle cable tension set properly
- ☐ Shifter operation correct
- ☐ Neutral safety start switch operational
- ☐ No inboard exhaust gas leaks
- ☐ No fuel / oil / water leaks on engine
- ☐ Engine box installed and secured

### **Dockside inspection of Generator, pre-start sequence and operating system**

- ☐ Review and follow manufacturer's manual for operation and maintenance
- ☐ Seawater strainer water-tight and clean
- ☐ No leaks in fuel system - Fuel filters clean
- ☐ Lube oil at full mark
- ☐ Coolant level full - proper mix ratio with water (per generator manual)
- ☐ Seawater discharge overboard with exhaust gas
- ☐ No inboard water or exhaust gas leaks
- ☐ Proper voltage output to distribution panel (per generator manual)
- ☐ Ship / shore power transfer panel function properly
- ☐ Starter battery box secured
- ☐ Starter battery cable connections clean and tight
- ☐ Starter battery electrolyte level proper

### **Climate Control System**

- ☐ Review and follow manufacturer's manual for operation and maintenance
- ☐ Seawater strainer water tight and clean
- ☐ Seawater pump air purged and operational
- ☐ Seawater flow adequate fwd and aft
- ☐ Fwd system functions properly in all modes of operation
- ☐ Aft system functions properly in all modes of operation
- ☐ No seawater leaks in system components and lines
- ☐ No condensation leaks to deck or liner
- ☐ Air return/intake filters clean and clear
- ☐ 110 or 220 VAC shore power wired correctly at dock
- ☐ Remote control panels operate correctly
- ☐ Condensation drains open

### **Pre-departure Checklist**

- ☐ Check bilge for extra water
- ☐ Check weather conditions and tides
- ☐ Check food supply
- ☐ Foul weather gear
- ☐ Linen, sleeping bags
- ☐ Fuel
- ☐ Water
- ☐ Sunscreen and sunglasses
- ☐ Tools
- ☐ Docking and anchoring gear
- ☐ Check radio operation
- ☐ Navigation charts and instruments

## Documents and Forms

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- \_\_\_\_\_ Float plan to a friend or Coast Guard
- \_\_\_\_\_ Fuel for Stove
- \_\_\_\_\_ Cooking and eating utensils
- \_\_\_\_\_ Oil level, tight V-belts
- \_\_\_\_\_ Check for loose electrical connections in the engine compartment
- \_\_\_\_\_ Secure loose tools or equipment in the engine compartment so as to not get fouled in the engine.
- \_\_\_\_\_ AC systems off, electrical cord stowed
- \_\_\_\_\_ Doors and drawers secure
- \_\_\_\_\_ Check steering lock to lock
- \_\_\_\_\_ No lines or obstructions near propeller or bow
- \_\_\_\_\_ Check mast for rigging irregularities and tightness
- \_\_\_\_\_ Halyards and sheets are ready to run
- \_\_\_\_\_ Anchor ready to run
- \_\_\_\_\_ Lifelines are tight
- \_\_\_\_\_ Turn on water lines
- \_\_\_\_\_ Stow all loose gear
- \_\_\_\_\_ Open engine cooling water thru intake valve

## Post Sailing Checklist

When leaving your boat at the dock for more than a short time, it is a good idea to review the following checklist to make sure everything is in order. This will help protect the various components of your boat and add considerably to their attractiveness and usable life.

- \_\_\_\_\_ Flake or furl mainsail and cover or remove and bag.
- \_\_\_\_\_ Remove and stow all portable deck hardware such as snatch blocks, winch handles, etc.
- \_\_\_\_\_ Secure the boom to the topping lifts and set it firmly amidships with the main sheet purchase.  
(It is also a good idea to rig a line from the steering wheel or tiller to a convenience cleat to keep the rudder from swinging back and forth with the motion of the water or employ the wheel brake if so equipped.)
- \_\_\_\_\_ Attach the shackle ends of all halyards to convenient fittings and take up slack. Find a location leading away from the mast to keep the halyard from slapping the mast.
- \_\_\_\_\_ Coil and stow all lines in line lockers
- \_\_\_\_\_ Cover the winches and steering pedestal when leaving the boat for several days or more
- \_\_\_\_\_ Close all fuel lines and seacocks
- \_\_\_\_\_ Switch off the electrical system
- \_\_\_\_\_ Pump out the bilge
- \_\_\_\_\_ Check air vents, secure ports and hatches, swab the deck, and clean deck stainless, particularly if you have operated in salt water.

## Documents and Forms

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### Float Plan

Name of Operator \_\_\_\_\_ Age \_\_\_\_\_

Address \_\_\_\_\_

Phone \_\_\_\_\_

Boat Make \_\_\_\_\_ Model \_\_\_\_\_

Length \_\_\_\_\_ Hull Color \_\_\_\_\_ Deck Color \_\_\_\_\_

Registration No. \_\_\_\_\_ Home Port \_\_\_\_\_

Radio frequencies \_\_\_\_\_

Equipment on Board, PFDs, Flares, Anchor \_\_\_\_\_

\_\_\_\_\_

Fuel Capacity \_\_\_\_\_ Water Capacity \_\_\_\_\_

Distinguishing Features \_\_\_\_\_

\_\_\_\_\_

Departed from \_\_\_\_\_

Date \_\_\_\_\_ Time \_\_\_\_\_

Destination \_\_\_\_\_

Stops \_\_\_\_\_

Estimated time of Arrival: Date \_\_\_\_\_ Time \_\_\_\_\_

Name, age, address and phone number of other persons on board:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

## Documents and Forms

DEPARTMENT OF HOMELAND SECURITY U.S. Coast Guard <b>RECREATIONAL BOATING ACCIDENT REPORT</b>			OMB Control Number: 1625-0003 Expires: 9/30/2014						
<b>INSTRUCTIONS:</b> Use "Report required because" section below to determine if a report is required for your accident. If required, please have each vessel owner or operator involved in the accident submit a report to their state reporting authority. Each boat operator/owner involved in an accident should submit a separate report. For each question below, please provide answers if applicable and if known; otherwise leave blank. Privacy Act Notice: Authority- 46 U.S.C. 6102 and 33 CFR 173 & 174 authorize the collection of information on boating accidents. Purpose-The Coast Guard uses this information for statistical purposes, chiefly to inform the public, to measure the Program's efforts, and to regulate issues relating to boating safety. Routine Uses-The Coast Guard shares this information within the agency, and if state and federal law permit it, to the public.									
<b>REPORT SUBMISSION</b>									
<b>Report required because</b> <i>(select all that apply):</i> <input type="checkbox"/> At least one person in this accident <i>died</i> : If so, how many? _____ <input type="checkbox"/> At least one injured person in this accident <i>required or was in need of treatment beyond first aid</i> : If so, how many? _____ <input type="checkbox"/> At least one person in this accident <i>disappeared</i> and has not yet been recovered: If so, how many? _____ <input type="checkbox"/> All boat and other property <i>damage (e.g., fishing/hunting gear)</i> caused by this accident <i>totaled (or likely totaled)</i> \$2,000 or more: Approximate value of damage to <i>your</i> boat: \$ _____ Approximate value of damage to <i>your</i> other property: \$ _____ <input type="checkbox"/> Your or another <i>boat</i> in this accident was <i>(or likely was)</i> a <i>total loss</i>		<b>To be submitted within:</b> 48 hours <i>(if injury, disappearance or death)</i> 10 days <i>(if boat/property damage only)</i>  <b>To be submitted to:</b> <i>(Local State Reporting Authority)</i>  <b>Phone:</b> You may submit any comments concerning the accuracy of the burden estimate or any suggestions for reducing the burden to: Commandant (CG-5422), U.S. Coast Guard, Washington, DC 20593-0001 or Office of Management and Budget, Paperwork Reduction Project (1625-0003), Washington, DC 20503. Questions relating to the collection of this data should be sent to the Coast Guard.							
<b>Report submitted by</b> <i>(select all that apply):</i> <input type="checkbox"/> Boat Operator <i>(required if possible)</i> <input type="checkbox"/> Boat Owner <i>(if operator unable, or same as operator)</i> <input type="checkbox"/> Other <i>(describe):</i> _____ _____		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th colspan="2" style="text-align: center; background-color: #f2f2f2;">For State Agency Use Only</th> </tr> </thead> <tbody> <tr> <td style="width: 50%; padding: 2px;">First Name</td> <td style="width: 50%; padding: 2px;">Last Name</td> </tr> <tr> <td colspan="2" style="padding: 2px;">Phone:</td> </tr> </tbody> </table>		For State Agency Use Only		First Name	Last Name	Phone:	
For State Agency Use Only									
First Name	Last Name								
Phone:									
First Name	Last Name	Phone	Primary Cause of Accident						
<b>ACCIDENT SUMMARY</b>									
<b>WHEN</b> Date: _____ Time: _____ am <input type="checkbox"/> pm <input type="checkbox"/> <i>(mm/dd/yyyy) (select one)</i>		<b>ACCIDENT DESCRIPTION:</b> <i>Briefly describe this accident (attach extra pages if necessary)</i>							
<b>WHERE</b> Body of Water Name _____  Location <i>(on water)</i> description _____  Nearest city/town _____  County: _____ State: _____									
<b>YOUR BOAT – PEOPLE</b> # people <i>on board (including operator)</i> : _____ # people <i>being towed (e.g., on tubes, skis)</i> : _____ # people <i>wearing lifejackets (on board or towed)</i> : _____		<b>DAMAGE TO YOUR BOAT:</b> <i>Briefly summarize any damage to your boat</i>   <b>DAMAGE TO YOUR OTHER PROPERTY: (NOT BOAT)</b> <i>Briefly summarize any damage to your other property (not boat)</i>							
<b>OTHER BOATS INVOLVED IN ACCIDENT</b> # of <i>other</i> boats involved: _____									

## Documents and Forms

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.															
<b>YOUR BOAT</b>															
<b>BOAT IDENTIFICATION</b>															
Your Boat Name:						Manufacturer:									
Model Name:						Model Year:									
Registration #:						Documentation #:									
Hull Identification # (HIN)						Rented: <input type="checkbox"/> Yes <input type="checkbox"/> No									
<b>SIZE ESTIMATES</b>															
Length: ft.		Depth from transom (stern) to keel (bottommost point):				ft.		in.		Beam width at widest point: ft.					
<b>HULL MATERIAL</b>															
Type of Hull Material (select one)															
Fiberglass		Wood		Rubber/vinyl/canvas		Other (describe):									
Aluminum		Steel		Plastic											
<b>BOAT TYPE</b>															
Boat Type (select one)						Available Propulsion (select all that apply)									
Cabin motorboat		Inflatable		Canoe		Personal watercraft (PWC) (e.g., Wave Runner™, Jet Ski™, Sea-Doo™)  Other (describe):		Propeller		Air thrust					
Open motorboat		Houseboat		Rowboat				Sail		Other (describe):					
Auxiliary sail		Sail (only)		Air boat				Manual							
Pontoon boat		Kayak						Water jet							
<b>ENGINE</b>															
# Engines		Engine type and horsepower (select one)						Fuel type (select all that apply)							
Manufacturer		Outboard		Sterndrive (I/O)		Inboard		None		Gasoline		Diesel		Electric	
		Total horsepower: hp													
<b>SAFETY MEASURES</b>															
Organizations that have conducted a vessel safety check (VSC) on board your boat within the past year (including carriage of safety equipment, e.g., lifejackets, anchor and line, fire extinguishers):															
US Coast Guard Auxiliary: VSC Decal? <input type="checkbox"/> Yes <input type="checkbox"/> No						Federal Agency (Name)									
US Power Squadrons: VSC Decal? <input type="checkbox"/> Yes <input type="checkbox"/> No						State Agency (Name)									
						Other Agency (Name)									
# Life jackets on board:		# Fire extinguishers on board:		Type of fire extinguishers (e.g., ABC):											
		# Fire extinguishers used:		Amount of fire extinguishers used:											
<b>ACCIDENT DETAILS – EXTERNAL CONDITIONS</b>															
<b>WEATHER</b>															
Overall weather was (select one)				It was (select one)		Visibility was (select one)			Wind was (select one)						
Clear		Raining		Day		Good			0 mph (none)						
Cloudy		Snowing		Night		Fair			Over 0, up to 12 mph (light)						
Foggy		Hazy					Poor			Over 12, up to 25 mph (moderate)					
Other (describe):				Approximate air temperature:			°F		Over 25, up to 55 mph (strong)						
									Over 55 mph (stormy)						
<b>WATER</b>															
Overall water conditions (select one):						Other water conditions:									
Up to 6 in. waves (calm)						Approximate water temperature:			°F						
Over 6 in., up to 2 ft. waves (choppy)						Strong current?			Yes		No				
Over 2 ft., up to 6 ft. waves (rough)						Hazardous waters? (e.g., rapid tidal flow, currents)			Yes		No				
Over 6 ft. waves (very rough)						Congested waters?			Yes		No				

## Documents and Forms

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.			
<b>ACCIDENT DETAILS – ACTIVITIES AND OPERATIONS ON YOUR BOAT</b>			
<b>OPERATOR/PASSENGER ACTIVITIES</b>			
Operator/passenger activities on <i>your</i> boat at time of accident:			
Activities were <i>(select one)</i>		Operator/Passenger activities <i>(select all that apply)</i>	
<input type="checkbox"/> Recreational	<input type="checkbox"/> Fishing	<input type="checkbox"/> Tubing	<input type="checkbox"/> Starting engine
<input type="checkbox"/> Commercial	<input type="checkbox"/> Hunting	<input type="checkbox"/> Water Skiing	<input type="checkbox"/> Making repairs
	<input type="checkbox"/> White water activity (e.g., rafting)	<input type="checkbox"/> Relaxing	<input type="checkbox"/> Other <i>(list)</i> :
<b>BOAT OPERATIONS</b>			
Your boat operations at time of accident <i>(select all that apply)</i>			
<input type="checkbox"/> Cruising <i>(underway under power)</i>	<input type="checkbox"/> Drifting	<input type="checkbox"/> Racing	<input type="checkbox"/> Towing another vessel
<input type="checkbox"/> Changing direction	<input type="checkbox"/> At anchor	<input type="checkbox"/> Rowing/paddling	<input type="checkbox"/> Launching
<input type="checkbox"/> Changing speed	<input type="checkbox"/> Being towed	<input type="checkbox"/> Docking/undocking	<input type="checkbox"/> Tied to dock/mooring
<input type="checkbox"/> Sailing	<input type="checkbox"/> Other <i>(list)</i>		
<b>ACCIDENT DETAILS – CONTRIBUTING FACTORS ON YOUR BOAT</b>			
<b>CONTRIBUTING FACTORS</b>			
Indicate factors on <i>your</i> boat which may have contributed to this accident <i>(select all that apply)</i>			
<input type="checkbox"/> Alcohol use	<input type="checkbox"/> Improper lookout	<input type="checkbox"/> Dam/lock	<input type="checkbox"/> Starting in gear
<input type="checkbox"/> Drug use	<input type="checkbox"/> Operator inattention	<input type="checkbox"/> Force of wake/wave	<input type="checkbox"/> Sharp turn
<input type="checkbox"/> Excessive speed	<input type="checkbox"/> Operator inexperience	<input type="checkbox"/> Hazardous waters	<input type="checkbox"/> Restricted vision (e.g., fog)
<input type="checkbox"/> Improper anchoring	<input type="checkbox"/> Language barrier	<input type="checkbox"/> Heavy weather	<input type="checkbox"/> Mission/inadequate aids to navigation (e.g., buoy, daymarker)
<input type="checkbox"/> Improper loading	<input type="checkbox"/> Navigation rules violation	<input type="checkbox"/> Ignition of fuel or vapor	<input type="checkbox"/> Inadequate on-board navigation lights
<input type="checkbox"/> Overloading	<input type="checkbox"/> Failure to vent	<input type="checkbox"/> Hull failure	<input type="checkbox"/> People on gunwale, bow or transom
<input type="checkbox"/> Other <i>(describe)</i> :			
<b>ACCIDENT DETAILS – YOUR BOAT</b>			
<b>MACHINERY/EQUIPMENT FAILURE</b>			
Failure of the following machinery/equipment on <i>your</i> boat contributed to this accident <i>(select all that apply)</i>			
<input type="checkbox"/> Engine	<input type="checkbox"/> Onboard lights	<input type="checkbox"/> Shift	<input type="checkbox"/> Sound equipment (e.g., horn, whistle)
<input type="checkbox"/> Electrical system	<input type="checkbox"/> Seats	<input type="checkbox"/> Radio	<input type="checkbox"/> Auxiliary equipment
<input type="checkbox"/> Fuel system	<input type="checkbox"/> Steering	<input type="checkbox"/> Fire extinguisher	<input type="checkbox"/> Other <i>(list)</i> :
<input type="checkbox"/> Sail/mast	<input type="checkbox"/> Throttle	<input type="checkbox"/> Ventilation	
<input type="checkbox"/> Onboard navigation aids (e.g., GPS)			
<b>ACCIDENT DETAILS – EVENTS ON YOUR BOAT</b>			
<b>ACCIDENT EVENTS</b>			
Types of events occurring to/on <i>your</i> boat during accident <i>(select all that apply)</i>			
<input type="checkbox"/> Collision with recreational boat	<input type="checkbox"/> Flooding/swamping	<input type="checkbox"/> Person fell overboard	
<input type="checkbox"/> Collision with commercial boat (e.g., tug, barge)	<input type="checkbox"/> Fire/explosion – fuel	<input type="checkbox"/> Person fell on/within boat	
<input type="checkbox"/> Collision with fixed object (e.g., dock, bridge)	<input type="checkbox"/> Fire/explosion – non-fuel	<input type="checkbox"/> Sudden medical condition	
<input type="checkbox"/> Collision with submerged object (e.g., stump, cable)	<input type="checkbox"/> Carbon monoxide exposure	<input type="checkbox"/> Person struck by boat	
<input type="checkbox"/> Collision with floating object (e.g., log, buoy)	<input type="checkbox"/> Mishap of skier, tuber, wake boarder, etc.	<input type="checkbox"/> Person struck by propeller or propulsion unit	
<input type="checkbox"/> Capsizing	<input type="checkbox"/> Person left boat voluntarily	<input type="checkbox"/> Person electrocuted	
<input type="checkbox"/> Grounding	<input type="checkbox"/> Person ejected from boat <i>(caused by collision or maneuver)</i>		
<input type="checkbox"/> Sinking	<input type="checkbox"/> Other <i>(describe)</i>		

## Documents and Forms

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.										
<b>ACCIDENT DETAILS – YOUR BOAT- INJURED PEOPLE RECEIVING OR IN NEED OF TREATMENT BEYOND FIRST AID</b>										
<i>Report only injured people on, struck by, or being towed by your boat, receiving or in need of treatment beyond first aid. Do not report injured people on, struck by, or being towed by another boat or no boat (e.g., swimmers, people on a dock). If more than one injured person to report, attach additional copies of this page. If none, SKIP INJURED PEOPLE section.</i>										
<b>INJURED PERSON</b>										
First Name			MI		Last Name					
Street										
City			State			Zip				
Phone			Date of Birth (mm/dd/yyyy)			Age				
<b>INJURY DETAILS</b>										
Injury caused when person (select all that apply)					Nature of most serious injury (select one)					
Struck the (e.g., boat, water):					Scrape/bruise		Dislocation			
Was struck by a (e.g., boat, propeller):					Cut		Internal organ injury			
Was exposed to carbon monoxide poisoning					Sprain/strain		Amputation			
Received an electric shock					Concussion/brain injury		Burn			
Other (describe):					Spinal cord injury		Other (describe):			
Person was wearing lifejacket?		<input type="checkbox"/> Yes		<input type="checkbox"/> No		Broken/fractured bone				
Person received treatment beyond first aid?		<input type="checkbox"/> Yes		<input type="checkbox"/> No		Body part of most serious injury (e.g., head, trunk, leg):				
Person was admitted to a hospital?		<input type="checkbox"/> Yes		<input type="checkbox"/> No						
<b>ACCIDENT DETAILS – YOUR BOAT – DEATHS/DISAPPEARANCES</b>										
<i>Only report deaths/disappearances of people on, struck by, or being towed by your boat. If more than one death/disappearance to report, attach additional copies of this page. If none, SKIP DEATHS/DISAPPEARANCES section.</i>										
<b>PERSON WHO DIED/DISAPPEARED</b>										
First Name			MI		Last Name					
Street										
City			State			Zip				
Phone			Date of Birth (mm/dd/yyyy)			Age				
<b>DETAILS OF DEATH/DISAPPEARANCE</b>										
Injury caused when person (select all that apply)					Nature of death/disappearance (select one)					
Struck the (e.g., boat, water):					Death – by drowning					
Was struck by a (e.g., boat, propeller):					Death – other likely cause (describe)					
Was exposed to carbon monoxide poisoning										
Received an electric shock					Disappeared and not yet recovered					
Other (describe):					Person was wearing lifejacket?		<input type="checkbox"/> Yes		<input type="checkbox"/> No	

## Documents and Forms

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.									
<b>ACCIDENT DETAILS – YOUR BOAT OPERATOR</b>									
<b>OPERATOR INSTRUCTION</b>					<b>OPERATOR SAFETY MEASURES</b>				
<b>Boating safety instruction completed</b> <i>(select all that apply)</i>					<b>On board, prior to accident, was operator wearing:</b>				
<input type="checkbox"/> None					A lifejacket?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<input type="checkbox"/> State course					An engine cut-off switch <i>(Lanyard or wireless device)</i> if equipped?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<input type="checkbox"/> USCG Auxiliary course					On board, prior to accident, was operator using:				
<input type="checkbox"/> US Power Squadrons course							Alcohol?	<input type="checkbox"/> Yes	<input type="checkbox"/> No
<input type="checkbox"/> Internet <i>(name of sponsoring organization)</i>					Drugs?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<input type="checkbox"/> Other <i>(describe)</i>					Operator arrested for Boating Under the Influence?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
					Weather reports consulted prior to accident?		<input type="checkbox"/> Yes	<input type="checkbox"/> No	
<b>OPERATOR EXPERIENCE</b>									
<b>Experience operating this type of boat</b> <i>(select one)</i>									
<input type="checkbox"/> 0 to 10 hours		<input type="checkbox"/> Over 10, up to 100 hours			<input type="checkbox"/> Over 100, up to 500 hours			<input type="checkbox"/> Over 500 hours	
<b>ACCIDENT DETAILS – OTHER KEY PEOPLE</b>									
<p><i>Only report other key people not already documented as injured, died, disappeared or operator/owner of your boat.</i></p> <p><i>If more than two other key people to report, attach additional copies of this page.</i></p>									
<b>NAME/ADDRESS</b>									
<b>This other key person was a(n)</b> <i>(select all that apply)</i>									
<input type="checkbox"/> Other boat operator <input type="checkbox"/> Other boat owner <input type="checkbox"/> Owner of other damaged property <input type="checkbox"/> Passenger on your boat <input type="checkbox"/> Witness									
First Name				MI		Last Name			
Street									
City				State		Zip		Phone	
Other boat name <i>(if any)</i>						Other boat registration # <i>(if any)</i>			
<b>NAME/ADDRESS</b>									
<b>This other key person was a(n)</b> <i>(select all that apply)</i>									
<input type="checkbox"/> Other boat operator <input type="checkbox"/> Other boat owner <input type="checkbox"/> Owner of other damaged property <input type="checkbox"/> Passenger on your boat <input type="checkbox"/> Witness									
First Name				MI		Last Name			
Street									
City				State		Zip		Phone	
Other boat name <i>(if any)</i>						Other boat registration # <i>(if any)</i>			



## Documents and Forms

For each question below, please provide answers IF APPLICABLE AND IF KNOWN, otherwise leave blank.						
<b>YOUR BOAT OPERATOR</b>						
<b>NAME/ADDRESS</b>						
First Name	MI	Last Name				
Street						
City	State	Zip				
<b>AGE/GENDER/PHONE</b>						
Date of Birth <small>(mm/dd/yyyy)</small>	Age	Gender	<input type="checkbox"/> Male	<input type="checkbox"/> Female	Phone	
<b>YOUR BOAT OWNER</b>						
If same as <i>your boat operator</i> SKIP rest of YOUR BOAT OWNER section.						
<b>NAME/ADDRESS/PHONE</b>						
First Name	MI	Last Name				
Street						
City	State	Zip	Phone			
<b>PERSON SUBMITTING THIS REPORT</b>						
If same as <i>your boat operator</i> OR <i>owner</i> , SKIP rest of PERSON SUBMITTING THIS REPORT section.						
<b>NAME/ADDRESS/PHONE/ROLE</b>						
First Name	MI	Last Name				
Street						
City	State	Zip	Phone			
<b>I was a(n) (select one)</b>						
<input type="checkbox"/>	Other person on board <i>this</i> boat					
<input type="checkbox"/>	Accident witness <i>not</i> on board <i>this</i> boat					
<input type="checkbox"/>	Other ( <i>describe</i> ):					
<b>SIGNATURE OF PERSON SUBMITTING THIS REPORT</b>						
<b>Your signature</b>					<b>Date</b> (mm/dd/yyyy)	
<p>An Agency may not conduct or sponsor and a person is not required to respond to an information collection, unless it displays a currently valid OMB Control Number.</p> <p>The Coast Guard estimates that the average burden for this report form is 30 minutes. You may submit any comments concerning the accuracy of this burden estimate or any suggestions for reducing the burden to: Commandant (CG-5422), U.S. Coast Guard, Washington, DC 20593-0001 or Office of Management and Budget, Paperwork Reduction Project (1625-0003), Washington, DC 20503.</p>						

### VESSEL INVENTORY- EMERGENCY EQUIPMENT

Date Purchased	Stowage Life	Description	Location on Board

The U.S. Coast Guard provides free to anyone a pamphlet titled "Federal Requirements for Recreational Boats"  
For more information go to [www.uscg.mil](http://www.uscg.mil).

[illegible]

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2.19

[illegible]

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[illegible]

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2.21

(Several copies may be required to complete each of the following categories)

Chapman's Piloting recommended operating techniques, maintenance inspections and safety points for my particular boat length and type of sailing

[illegible]

This image shows a full page of blank, lined paper. It features approximately 28 horizontal blue or grey lines spaced evenly apart, typical of notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.

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This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are no margins, text, or other markings on the paper.



This image shows a full page of blank, lined paper. It features approximately 30 horizontal blue or grey lines spaced evenly apart, typical of notebook paper. The lines extend across the entire width of the page, leaving small margins at the top and bottom. There are no vertical lines, text, or other markings on the page.



MARLOW-HUNTER, LLC

*Chapter 3*

***Limited  
Warranty***

***MH31***



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**Y**our boat comes with a prorated Two-Year Limited Warranty and a Five-Year Limited Hull Structure and Bottom Blister Warranty. The actual warranty is outlined in the subsequent pages of this chapter and is organized into the following sections:

1. General Information
2. Phase One of the Limited Two-Year Warranty
3. Phase Two of the Limited Two-Year Warranty
4. Limited Five-Year Hull Structure and Bottom Blister Warranty
5. Restrictions Applicable to Warranties
6. Warranty Registration
7. Transfer of Limited Warranties
8. Owner Information Card
9. Pre-Delivery Service Record (PDSR)
10. Warranty Registration Form
11. Sample Acknowledgment of Ownership Transfer
12. Graphical Explanation of Warranty Coverage



**MARLOW-HUNTER, LLC**

**Each Better Than the Last**

**YOUR MARLOW-HUNTER LIMITED WARRANTY**

Marlow-Hunter, LLC ("Hunter") offers a prorated Limited Warranty on every boat sold and commissioned through an authorized Hunter dealer. A copy of this prorated Limited Warranty is included here, and in your Operator's Manual. If for some reason you are not able to understand the terms of the prorated Limited Warranty, read, or view this document, please contact your local dealer for a replacement copy.

We stand behind the quality of your boat with the above and below mentioned warranty, which you should review. To insure the operation and validity of your prorated limited warranty, please complete the attached card and send it to Marlow-Hunter, LLC within ten (10) days of the purchase date. Section 15 of the U.S. Federal Boat Safety Act requires registration of a boat's first owner. Maintain a copy of the completed owner card for your own reference.

The following prorated warranties apply to all 2015 Model Year boats produced by MARLOW-HUNTER, LLC:

**Phase one of the LIMITED TWO-YEAR WARRANTY:**

During the first year of ownership or remaining coverage period Hunter warrants to the first-use purchaser and any subsequent owner during this limited warranty period that any part manufactured by Hunter will be free of defects caused by faulty workmanship or materials for a period of twelve (12) months from the date of delivery to the first-use purchaser (see special conditions below) under normal use and service. During this period, as the sole and exclusive remedy, Hunter's obligation under the warranty is limited to the repair or replacement of any such part deemed defective by Hunter. Reimbursement for warranty repairs are to be based on a reasonable number of hours and labor rate established by Hunter.

**ALL HUNTER WARRANTS AUTOMATICALLY START NINE MONTHS AFTER THE BOAT LEAVES HUNTER.**

**Phase two of the LIMITED TWO-YEAR WARRANTY:**

During the second year of ownership or remaining coverage period Hunter warrants to the first-use purchaser that any part manufactured by Hunter will be free of defects caused by faulty workmanship or materials. This additional twelve (12) months of coverage ends twenty four (24) months from the date of delivery to the first use purchaser under normal use and service or thirty three (33) months after the boat leaves Hunter. During this period, as the sole and



exclusive remedy, Hunter's obligation under the warranty is limited to the repair or replacement of any such part deemed defective by Hunter. Reimbursement for warranty repairs during the second year are to be based on a reasonable number of hours and at fifty percent of the labor rate established by Hunter.

#### LIMITED FIVE-YEAR HULL STRUCTURE AND BOTTOM BLISTER WARRANTY

Hunter warrants to the first-use purchaser and any subsequent owner during the limited warranty period that the hull of each boat will be free from structural defects in materials and workmanship for a period of five (5) years from the date of delivery to the first-use purchaser (see special conditions below) under normal use and service.

This limited warranty applies only to the structural integrity of the hull and the supporting pan/grid or stringer system. Hulls, pan/grid or stringers modified in any way or powered with engines other than the type and size installed or specified by Hunter are not covered by this limited warranty. As the sole and exclusive remedy, Hunter's obligation under the warranty is limited to repair or replacement of any such defective part.

ALL HUNTER WARRANTIES AUTOMATICALLY START NINE MONTHS AFTER THE BOAT LEAVES HUNTER.

Hunter also warrants to the first-use purchaser and any subsequent owner during the warranty period that the boat will be free from gelcoat blistering on underwater surfaces of the hull, excluding the keel and rudder, for a period of five (5) years from the date of delivery to the first-use purchaser (see special conditions below) under normal use and service. During this period, Hunter will supply or reimburse an authorized Hunter dealer for labor required to repair a blistered underwater surface of the hull. The labor cost reimbursement will be based on the Labor Allowance Schedule established by Hunter from time to time, however if the repair is performed by a non-Hunter dealer, the repair cost must be authorized by Hunter in advance and be based on a reasonable number of hours as determined by Hunter. Hunter will not pay transportation, hauling, launching, bottom paint, storage, dockage, cradling rental, rigging and derigging, or other similar costs. It is recommended that the repair be done during a seasonal haul out for service or storage.

HUNTER EXPRESSLY DISCLAIMS THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS. NEITHER HUNTER NOR THE SELLING DEALER SHALL HAVE ANY RESPONSIBILITY FOR LOSS OF USE OF A BOAT, LOSS OF TIME, INCONVENIENCE, COMMERCIAL LOSS, OR CONSEQUENTIAL DAMAGES.

ALL HUNTER WARRANTIES AUTOMATICALLY START NINE MONTHS AFTER THE BOAT LEAVES HUNTER.

## RESTRICTIONS APPLICABLE TO WARRANTIES

The following circumstances will void the bottom blister limited warranty:

- (1) If the gel-coat has been sanded, sandblasted, or subjected to abrasion or impact.
- (2) If the instructions provided in the Hunter Operator's Manual are not followed according to Hunter's required bottom preparation procedures.

These prorated Limited Warranties do not cover:

- (1.) Paint, sealants, adhesives, window glass, gelcoat, upholstery damage, plastic finishes, engines, engine parts, bilge pumps, stoves, blowers, pressure water pumps, propellers, shafts, rudders, controls, instruments, keels, hoses and equipment not manufactured by HUNTER. Any warranty made and issued by the manufacturer of such items will be, if and where available, provided to the first use purchaser.
- (2.) Problems caused by improper maintenance, storage, cradling, blocking, normal wear and tear, insect control, misuse, neglect, accident, corrosion, electrolysis or improper operation.
- (3) Boats used for hire, training, co-ownership fleets and/or fractional ownership programs and commercial activities including charter.

THESE LIMITED WARRANTIES ARE YOUR SOLE AND EXCLUSIVE REMEDIES AND ARE EXPRESSLY IN LIEU OF ANY AND ALL OTHER REMEDIES AND WARRANTIES EXPRESSED AND IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, WHETHER ARISING BY LAW, CUSTOM, CONDUCT, OR USAGE OF TRADE. SOME STATES DO NOT ALLOW LIMITATIONS ON HOW LONG AN IMPLIED WARRANTY LASTS, SO THE ABOVE LIMITATION MAY NOT APPLY TO YOU. IN THE EVENT THAT IMPLIED WARRANTIES ARE FOUND TO EXIST UNDER THE LAW OF A PARTICULAR STATE, NOTWITHSTANDING THE EXCLUSION CONTAINED HEREIN, THE DURATION OF ANY SUCH IMPLIED WARRANTY SHALL BE LIMITED TO THE DURATION OF THE APPLICABLE LIMITED WARRANTY STATED HEREIN. THE PURCHASER ACKNOWLEDGES THAT NO OTHER REPRESENTATIONS WERE MADE TO HIM OR HER WITH RESPECT TO THE QUALITY OR FUNCTION OF THE BOAT. ANY ORAL STATEMENT OR PRINTED MATERIAL ADVERTISING THE BOAT WHICH SPEAKS TO ANY PERFORMANCE CHARACTERISTIC OF THE BOAT OR ANY OF ITS COMPONENTS SHALL BE CONSIDERED AND CONSTRUED AS AN ESTIMATED DESCRIPTION ONLY AND SHOULD NOT BE RELIED UPON AS AN EXPRESS WARRANTY OR AS THE BASIS OF THE BARGAIN FOR THE BOAT OR ANY OF ITS COMPONENTS.

ANY CONSEQUENTIAL, INDIRECT OR INCIDENTAL DAMAGES WHICH MAY BE INCURRED ARE EXCLUDED AND PURCHASER'S REMEDY IS LIMITED TO REPAIRS OR REPLACEMENT OF ANY SUCH PART(S). SOME STATES DO NOT ALLOW THE EXCLUSION OR LIMITATION OF INCIDENTAL OR CONSEQUENTIAL OR INDIRECT DAMAGES, SO THE ABOVE LIMITATION OR EXCLUSION MAY NOT APPLY TO YOU. THIS WARRANTY GIVES YOU SPECIFIC LEGAL RIGHTS, AND YOU MAY ALSO HAVE OTHER RIGHTS WHICH VARY FROM STATE TO STATE.

#### WARRANTY REGISTRATION

These limited warranties shall not be effective unless the HUNTER Warranty Registration Form and Pre-Delivery Service Record, which are furnished with each new boat, are filled out completely and returned to HUNTER within ten (10) days of delivery.

Return of the Warranty Registration Form to HUNTER, signed by both Dealer and Owner, is critical. Warranty coverage cannot be initiated until the completed form is received at HUNTER.

All repairs and/or replacements will be made by an authorized Hunter dealer, or at the option of Hunter, at the Hunter plant. If the repairs are of such a nature that the warranty work must be performed at the HUNTER plant, transportation costs to and from the HUNTER plant shall be paid by the owner. The labor cost reimbursement will be based on a Labor Allowance Schedule established by HUNTER and where not applicable, on a reasonable number of hours as determined by HUNTER. Any repairs and replacements must be approved in advance by an authorized HUNTER service representative.

You should also complete the warranty registration for your engine, stove, head, electric water pump and other accessories, if applicable. Warranty information and registration procedures for these components are found within manufacturers' websites or the manufacturers' manuals digitally included with Hunter's digital Operator's Manual.

#### TRANSFER OF LIMITED WARRANTIES

The limited warranties will be transferred to a subsequent purchaser of the boat if:

- (1) A notice of the transfer of ownership of the boat is given by the subsequent purchaser in writing to Hunter within thirty (30) days of the transfer.
- (2) The notice shall include the name, address, email address and telephone number of the subsequent purchaser, the date of purchase, the hull number and the name of the seller of the boat.

**MARLOW-HUNTER, LLC**

**OWNER INFORMATION CARD**

THE HULL IDENTIFICATION NUMBER IS ON THE STARBOARD AFT SIDE OF THE HULL OR TRANSOM. THIS NUMBER MUST BE PROVIDED IN ALL NECESSARY CORRESPONDENCE.

HULL NO. \_\_\_\_\_

DATE DELIVERED TO OWNER \_\_\_\_\_

YACHT NAME \_\_\_\_\_

OWNER NAME \_\_\_\_\_

STREET ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE/COUNTRY \_\_\_\_\_ ZIP CODE \_\_\_\_\_

HOME PORT \_\_\_\_\_

ENGINE MODEL \_\_\_\_\_ SERIAL NO. \_\_\_\_\_ PROP SIZE \_\_\_\_\_

DEALER \_\_\_\_\_ PHONE \_\_\_\_\_

STREET ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE/COUNTRY \_\_\_\_\_ ZIP CODE \_\_\_\_\_

CUSTOMER SERVICE / WARRANTY

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

# Limited Warranty

**MARLOW-HUNTER, LLC**  
P.O. BOX 1030 – ALACHUA, FL 32616

## PRE-DELIVERY SERVICE RECORD

**IMPORTANT:** This completed report is required for processing of claims for warranty adjustment. Please forward immediately.

DEALER NAME			OWNER NAME		
ADDRESS			ADDRESS		
CITY		STATE/ZIP	CITY		STATE/ZIP
HULL #	YEAR	SIZE	ENG #	ENGINE MAKE	

### BEFORE LAUNCH PROCEDURE:

	DEALER	OWNER
1. Prop Size _____ Shaft Size _____	_____	_____
2. Prop Rotation _____	_____	_____
3. Prop installed properly with cotter pin in shaft	_____	_____
4. Shaft turns freely	_____	_____
5. Shaft aligned in shaft log tube	_____	_____
6. Shaft alignment in relation to strut	_____	_____
7. Engine intake thru hull clear and installed properly	_____	_____
8. Pet-cocks closed on engine	_____	_____
9. Rudder swings freely – no binding or hard spots (check with wheel)	_____	_____
10. Emergency tiller steering system, complete operational check with owner	_____	_____
11. Primary steering system, complete operational check	_____	_____
12. Cockpit seat hatches lift smoothly	_____	_____
13. Companionway sliding hatch and door works smoothly	_____	_____
14. Check keel bolts for tightness	_____	_____
15. Hook up and tighten battery cables	_____	_____
16. Check hose clamps on engine pickup, engine exhaust, vanity drain, galley drain, fresh water system, toilet hoses and bilge pump – A/C – genset	_____	_____
17. Electrical equipment operational: ( ) Running lights ( ) Cabin lights ( ) Anchor light ( ) Steaming light ( ) Stern light ( ) Courtesy lights	_____	_____
18. Check bilge pumping system – operational	_____	_____
19. VHF radio operational	_____	_____
20. Mast wire tube properly sealed	_____	_____
21. Check optional dripless packing spring tension & set screws	_____	_____

### BOAT IN WATER:

22. Check for leaks: rudder post, shaft log, stuffing box, strut bolts and keel bolts	_____	_____
23. Check for thru-hull fitting leaks: engine pickup, galley sink drain, toilet pickup, toilet discharge, knot/depth, A/C, refrigerator	_____	_____
24. Check windows and deck hardware for leaks	_____	_____
25. Check opening ports and hatches for leaks	_____	_____
26. Check rub rail and deck joints for leaks	_____	_____
27. 110 dockside cord and receptacles OK	_____	_____
28. Toilet operates OK, intake open, outlet open, pumps OK	_____	_____
29. Pressure water system operates OK (let pressure stand for 15 minutes to see if pump goes on)	_____	_____
30. Hot water heater operation OK	_____	_____
31. Check stove system for leaks per manufacturer's instructions	_____	_____
32. With fuel tank full, no leaks at fill pipe, overflow vent or any fuel line connections or gauge	_____	_____
33. Drawers work smoothly	_____	_____
34. Doors work smoothly	_____	_____
35. Engine aligned .004 or less	_____	_____
36. Check and tighten all engine mount attachments	_____	_____
37. Check and tighten all engine flange and coupling bolts	_____	_____

### BEFORE STARTING ENGINE:

38. Throttle control cable travel and brackets OK	_____	_____
39. Clutch control cable travel and brackets OK	_____	_____
40. Crank case oil level at full mark	_____	_____
41. Transmission oil level at full mark	_____	_____
42. Engine shut off OK	_____	_____
43. Engine water pickup OK	_____	_____
44. Bleed air out of fuel line	_____	_____
45. Check heat exchanger fluid level and overflow bottle	_____	_____

### AFTER STARTING ENGINE:

	DEALER	OWNER
46. Oil pressure OK	_____	_____
47. Water flow out of exhaust	_____	_____
48. Check fuel line connections for leaks	_____	_____
49. No engine water or oil leaks	_____	_____
50. Idling speed OK, Max RPM OK	_____	_____
51. Gear shifts work properly – forward, reverse, neutral	_____	_____
52. Instruments register properly	_____	_____
53. Check stuffing box drip rate (3-4/minute)	_____	_____
54. Purge optional dripless packing assembly	_____	_____
55. Hour meter reading properly	_____	_____

### OPTIONAL GENERATOR ENGINE:

56. Crank case oil level at full mark	_____	_____
57. Engine water pickup open	_____	_____
58. Check heat exchanger fluid level and overflow bottle if supplied	_____	_____
59. Bleed air out of line	_____	_____
60. Check flow out exhaust	_____	_____
61. Hour meter reading properly	_____	_____

### RIGGING:

62. Mast steaming light OK	_____	_____
63. Spreaders properly secured	_____	_____
64. Shrouds and stays right length	_____	_____
65. Main and jib halyards right length	_____	_____
66. Jib fits properly	_____	_____
67. Main fits and operates properly	_____	_____
68. Topping lift, out haul, reefing system installed properly	_____	_____
69. Install windex	_____	_____
70. Main sheet and blocks OK	_____	_____
71. Jib sheet and blocks OK	_____	_____
72. Winch handles fit and winches smooth	_____	_____
73. Rigging properly tuned and pinned	_____	_____
74. Furling system operational	_____	_____
75. Traveler arch ground wire installed	_____	_____

### FINAL CHECK:

76. All accessory equipment on board	_____	_____
77. All loose gear on board	_____	_____
78. Owner's manual on board	_____	_____
79. Warranty registration form completed and signed	_____	_____
80. Owner familiarized with operation and warranty policy	_____	_____
81. Boat properly cleaned, interior and exterior	_____	_____
82. Owner advised to complete component warranty cards	_____	_____
83. All plexiglass hatches and ports free of scratches	_____	_____
84. All interior wood free of dents, dings and scratches	_____	_____
85. Interior cushions, bedding & curtains clean and free of defects	_____	_____
86. Exterior gelcoat free of defects	_____	_____
87. Free of water intrusion above and below the water line	_____	_____
88. All electronic equipment calibrated and operational	_____	_____
89. Exterior wood free of defects	_____	_____
90. Life lines adjusted and secure	_____	_____

Dealer Signature: \_\_\_\_\_

Date: \_\_\_\_\_

I have received, read and understand completely the Marlow-Hunter Limited Warranty for my boat.

Owner Signature: \_\_\_\_\_

Date: \_\_\_\_\_

DEALER COMMENTS (Refer to check list by item #

Remove 2<sup>nd</sup> & 3<sup>rd</sup> Copies and Forward Form Intact.

DISTRIBUTION: Original – Marlow-Hunter Service Dept., Canary – Owner, Pink – Dealer  
FORM #300-16/0112

## Limited Warranty

### WARRANTY REGISTRATION



MARLOW-HUNTER, LLC  
P.O. BOX 1030, HWY. 441  
ALACHUA, FL 32615  
(386) 462-3077 Fax (386) 462-4077

Year \_\_\_\_\_ Engine Model & Serial # \_\_\_\_\_

Model \_\_\_\_\_ Generator Model & Serial # \_\_\_\_\_

Hull # \_\_\_\_\_

Date Delivered to Dealer \_\_\_\_\_ Date Delivered to Customer \_\_\_\_\_

#### OWNER

Street \_\_\_\_\_ E-mail Address \_\_\_\_\_

City & State \_\_\_\_\_ Zip Code \_\_\_\_\_

Phone: Home \_\_\_\_\_ Work \_\_\_\_\_ Fax \_\_\_\_\_

Boat Name \_\_\_\_\_ Location of Boat (Zip-code only) \_\_\_\_\_

#### DEALER

Dealer Code \_\_\_\_\_

Street \_\_\_\_\_ Dealer Salesperson \_\_\_\_\_

City & State \_\_\_\_\_ Zip Code \_\_\_\_\_

Phone \_\_\_\_\_ Fax \_\_\_\_\_

#### FINAL CHECK OUT:

- ☐ OWNER FAMILIARIZED WITH HUNTER WARRANTY & OWNERSHIP RESPONSIBILITIES.
- ☐ OWNER FAMILIARIZED WITH DEALERSHIP WARRANTY AND SERVICE POLICIES.
- ☐ OWNER RECEIVED THE HUNTER OWNER'S MANUAL, ENGINE AND ACCESSORY MANUALS.
- ☐ OWNER RECEIVED & APPROVED PRE-DELIVERY SERVICE RECORD.

*I understand that it is my responsibility to have read and familiarized myself with the contents of the Marlow-Hunter Owner's Manual, the various engine and component manuals, and the Marlow-Hunter Limited Warranty.*

OWNER'S SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

#### BOAT INSPECTION – OWNER FAMILIARIZED WITH THE OPERATION OF:

- |   |  |  |
|---|--|--|
| <input type="checkbox"/> FUEL SYSTEM                | <input type="checkbox"/> ENGINE AND DRIVE SYSTEM   | <input type="checkbox"/> STEERING SYSTEM         |
| <input type="checkbox"/> WATER SYSTEM               | <input type="checkbox"/> SAFETY SYSTEMS            | <input type="checkbox"/> MAINTENANCE & UPKEEP    |
| <input type="checkbox"/> AC/DC ELECTRICAL SYSTEM    | <input type="checkbox"/> OPERATION OF WASTE SYSTEM | <input type="checkbox"/> HANDLING & OPERATION    |
| <input type="checkbox"/> STANDING & RUNNING RIGGING | <input type="checkbox"/> STOVE OPERATION           | <input type="checkbox"/> OWNER SPECIFIED OPTIONS |

*I understand that it is my responsibility to read and familiarize myself with the contents of the Marlow-Hunter Owner's Manual, the various engine and component manuals, and the Marlow-Hunter, LLC Limited Warranty. The Marlow-Hunter, LLC Limited Warranty gives you specific rights. You may also have other rights which vary from state to state. To activate your warranty, please complete this form and return it to MARLOW-HUNTER, LLC. within 10 days of delivery.*

OWNER'S SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

DEALER'S SIGNATURE \_\_\_\_\_ DATE \_\_\_\_\_

## Limited Warranty

November 6, 2013

Mr. John Smith  
1456 Joy Street  
Sarasota, FL 34266

Dear Mr. Smith,

Thank you for providing written notice of transfer of ownership. We are pleased you have selected a Hunter sailboat and we will make every effort to assure Hunter ownership will be a satisfying experience for you.

Based on the information you have provided, we are pleased to notify you of the expiration dates of the limited warranties.

- The limited two-year New Boat warranty expires (d)\_\_\_\_\_.
- The limited five-year Hull Structure and Bottom Blister warranty expires (d)\_\_\_\_\_.

Should you require assistance at any time during ownership, we encourage you to contact your Hunter dealer or to call us directly at 336-462-3077.

Please confirm the information at the bottom of the page and advise us if any corrections are required.

\_\_\_\_\_  
Customer Service Manager

Hull No: \_\_\_\_\_ Model: \_\_\_\_\_

Telephone: (H) \_\_\_\_\_ (C) \_\_\_\_\_

Date of Purchase: \_\_\_\_\_

Purchased From:

Name: \_\_\_\_\_

Address: \_\_\_\_\_

City/State: \_\_\_\_\_ Zip: \_\_\_\_\_

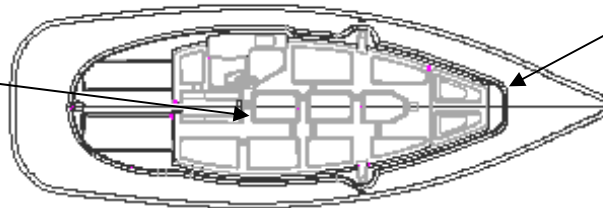
( ) Private Owner

( ) Dealer

## Limited Warranty

### GRAPHICAL EXPLANATION OF WARRANTY COVERAGE - KEEL BOATS

Internal fiberglass pan and fiberglass grid system are covered by the five-year limited warranty.



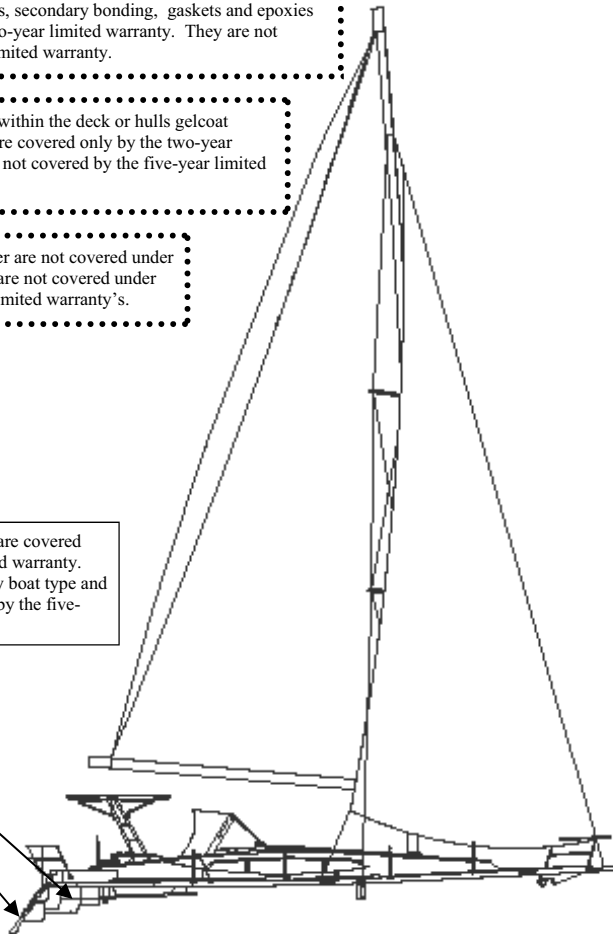
All fiberglass tabbing, overlays, epoxy and secondary bonding are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.

Footnote 1. All wooden bulkheads, modular components, floors, floor supports, paneling, trim, coring materials, faceplates, countertops, fiberglass tabbing, overlays, secondary bonding, gaskets and epoxies are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.

Footnote 2. Voids located within the deck or hulls gelcoat surface or build laminate are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.

Footnote 3. Keel and rudder are not covered under the blister warranty. They are not covered under the two-year or five-year limited warranty's.

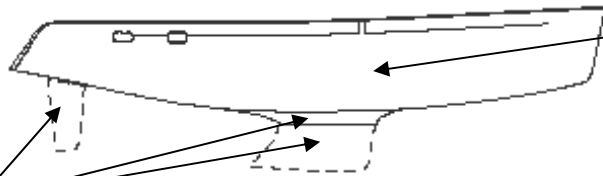
Deck and deck floor-pans are covered only by the two-year limited warranty. Floor-pan sizes will vary by boat type and size. They are not covered by the five-year limited warranty.



Internal fiberglass pan and fiberglass grid system are covered by the five-year limited warranty.



Rudder and keel are excluded from all warranties. Keel leaks at the attachment point are excluded from all warranties.



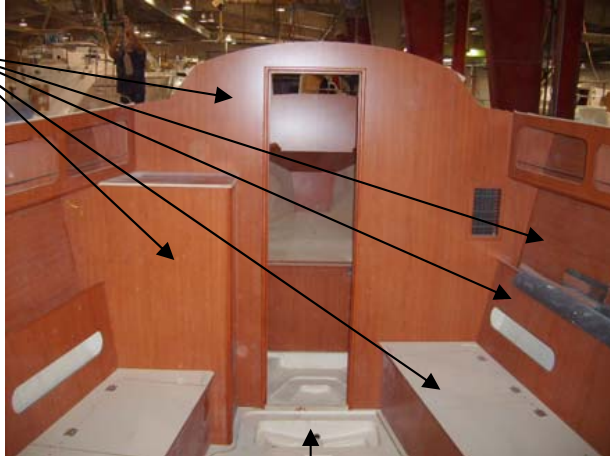
The fiberglass hull component is covered by the five-year limited warranty. Installed items such as (but not limited to) ports, shafting, thru-hulls, vents and struts are not covered by the five-year limited warranty. The rudder and keel are excluded from all warranties.



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GRAPHICAL EXPLANATION OF WARRANTY COVERAGE - KEEL BOATS

All wooden bulkheads, modular components, floors, floor supports, paneling, trim, coring materials, faceplates, counter-tops are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.



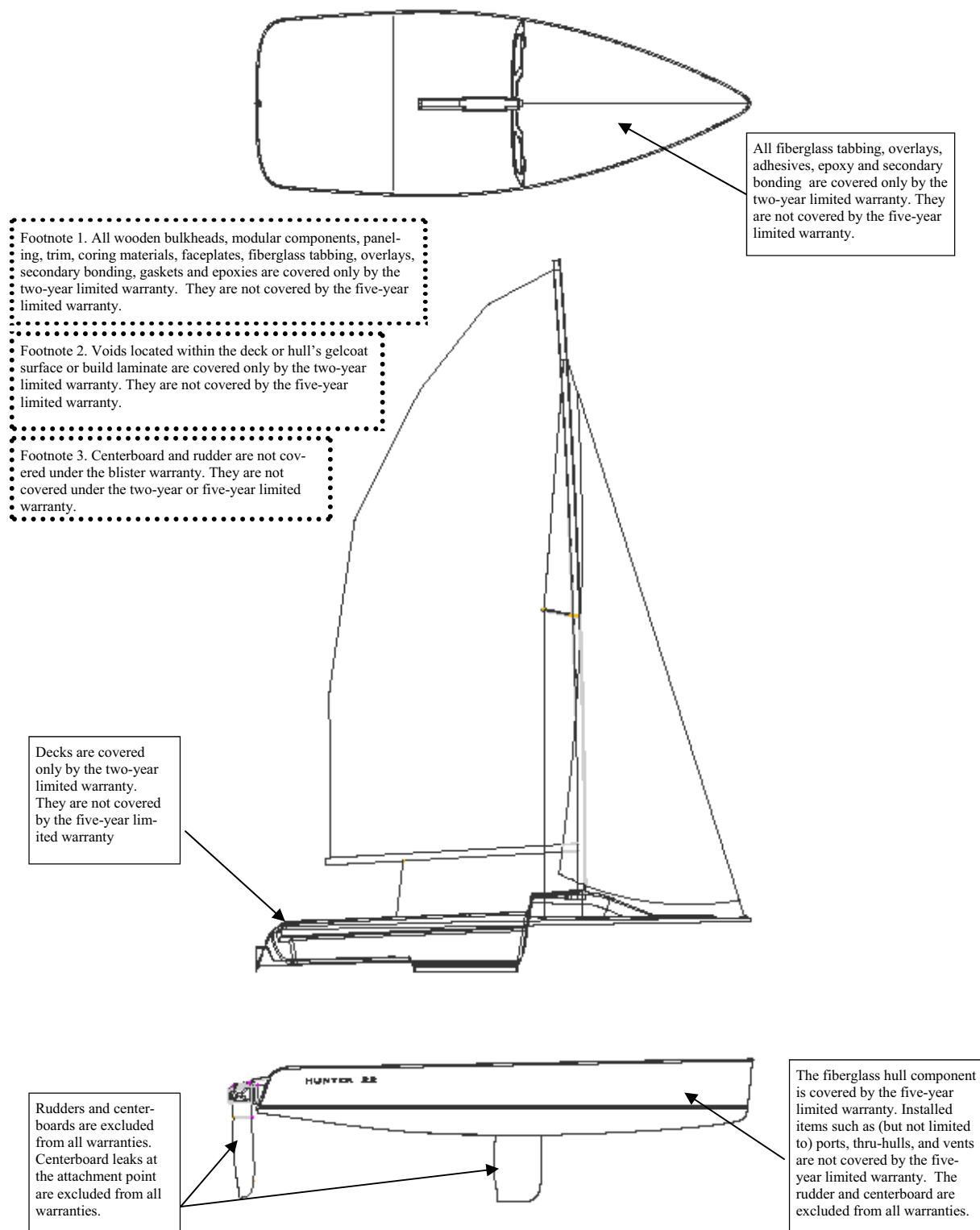
Internal fiberglass pan and fiberglass grid system are covered by the five-year limited warranty.

All fiberglass tabbing, overlays, secondary bonding, gaskets and epoxies are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.



## Limited Warranty

### GRAPHICAL EXPLANATION OF WARRANTY COVERAGE—TRAILERABLES



## Limited Warranty

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### GRAPHICAL EXPLANATION OF WARRANTY COVERAGE—TRAILERABLES

All wooden bulkheads, modular components, supports, paneling, trim, coring materials and faceplates are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.



All fiberglass tabbing, overlays, secondary bonding, gaskets and epoxies are covered only by the two-year limited warranty. They are not covered by the five-year limited warranty.

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, typical of notebook or legal stationery. There are no margins, text, or other markings present.



MARLOW-HUNTER, LLC

*Chapter 4*

# ***Boating Safety***

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***MH31***



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## Boating Safety

**B**oating safety is a paramount objective. Understanding and preparing for the potential hazards one may face on the water is critical. This chapter will discuss the following topics to cultivate a safety mindset and assist your understanding and preparedness for your boating activities:

1. Hazard Alerts
2. General Safety Issues
3. Carbon Monoxide Hazard
4. Other Potential Dangers
5. Fire
6. Distress Signals

### 4.1 Hazard Alerts

As you read your Operator's Manual, please note the hazard alerts intended to warn you of issues that could impact your safety. We have stated these alerts for your safety and that of your passengers. Hazard statements generally have five parts:

1. The hazard symbol.
2. A signal word which indicates the severity of the hazard.
3. A concise description of the hazard.
4. The results of ignoring the hazard.
5. Steps for avoiding the hazard.

The three signal words which indicate the severity of a hazard are DANGER, WARNING, and CAUTION. The meanings they convey are as follows:

#### **DANGER**

**Calls attention to immediate hazards that will result in severe injury or death.**

#### **WARNING**

**Identifies hazards or unsafe practices that could result in personal injury or death.**

#### **CAUTION**

**Indicates hazards or unsafe practices that could result in minor personal injuries, property damage, or component damage.**

Also included in this manual are owner advisory statements identified as "IMPORTANT" or "NOTE". Unlike the hazard communication statements, they alert you to conditions related to equipment, including equipment operation, maintenance, and servicing practices.

***IMPORTANT:** This is a general advisory statement or procedure intended to highlight significant issues regarding equipment or to prevent damage to equipment or associated components.*

***NOTE:** This is a general advisory statement relating to equipment operating and maintenance procedures. Its intent is to call attention to information more important than normal text.*

### 4.2 General Safety Issues

As an owner/operator, boating safety and the safety of your passengers are your responsibility. You should fully understand the operating and safety procedures and precautions listed in this Operator's Manual and the accompanying OEM (Original Equipment Manufacturer) manuals before you launch your new boat.

#### **WARNING**

##### **CALIFORNIA PROPOSITION 65 WARNING**

**Lead on battery posts, terminals and related accessories, exhaust and some constituents from diesel engine exhaust and some materials used in the construction of this product are known to the State of California to cause cancer, and other reproductive harm.**

#### 4.2.1 Safe Operation

Maintain your boat and equipment in safe operating condition. Ensure the hull, engines, safety equipment, and all boating gear are inspected regularly.

***IMPORTANT:** Federal law requires you, the owner or operator, to provide and maintain safety equipment on your boat. Consult your Coast Guard, state, and local regulations to ensure your boat has all required safety equipment on board. Additional equipment may be recommended for your safety and that of your passengers. Make yourself aware of its availability and use.*

- **USE CAUTION** when fueling your boat. Ensure you add fuel using the appropriate fill location (marked "Fuel" or "Diesel". See the Fuel chapter in this manual

for further details.

- Make sure you have enough fuel on board for anticipated cruising requirements. In general, use 1/3 of your supply to reach your destination and 1/3 to return. Keep 1/3 in reserve for changes in your plans due to weather or other circumstances.

*NOTE: The supply line for the optional generator is located higher on the fuel tank than the engine's supply lines. This is for your safety by preventing the generator from depleting your fuel supply should it ever be left running.*

- Be sure life-saving and fire extinguishing equipment is on board. This equipment must meet regulatory agency standards, and it should be noticeable, accessible, and in a safe operating condition. Your passengers should know where this equipment is and how to use it.
- Keep an eye on the weather. Be aware of possible changing conditions by checking a local weather report before your departure. Monitor strong winds and electrical storms closely.
- Always keep accurate, updated charts of the area on board your boat.
- Before you leave the port or harbor, file a Float Plan with a family member, relative, friend, or other responsible person ashore.
- Always operate your boat with care, courtesy, and common sense.
- Instruct at least one other passenger aboard in the operating procedures in handling your boat. This person can take over if you unexpectedly become unable to do so.
- Do not allow passengers to ride on parts of your boat other than designated seating areas.
- Ask all passengers to remain seated while the boat is in motion.
- **DO NOT USE THE SWIM PLATFORM OR BOARDING LADDER WHILE ENGINES ARE RUNNING.**
- Understand and obey the "Rules of the Road."
- Always maintain complete control of your boat.
- Do not overload or improperly load your boat.

### 4.2.2 Safe Boating Courses

Within the U.S., safe boating information and courses are available from a variety of sources. The Coast Guard Auxiliary website for boat safety, [www.cgaux.org](http://www.cgaux.org), contains a wide selection of opportunities for education on

boat safety. Similarly, the U.S. Power Squadrons' website, [www.usps.org](http://www.usps.org), and the Boat Owners Association of the U.S. website, [www.boatus.com/foundation](http://www.boatus.com/foundation), also offers opportunities for education in safety and operation.

Outside the U.S., consult your governmental branch responsible for overseeing your country's recreational boating for educational options on safe boating.

### 4.2.3 Voluntary Inspections

State boating officials in many states or the U.S. Coast Guard Auxiliary offer courtesy inspections to check out your craft. They check your boat for compliance with safety standards and required safety equipment. You may voluntarily consent to these inspections and are generally allowed time to make required corrections without prosecution. Check with the appropriate state agency or the Coast Guard Auxiliary for details.

### 4.2.4 Rules of the Road

Navigating a boat is much the same as driving an automobile. Operating either one responsibly means complying with a set of rules intended to prevent accidents. Just as you assume other car drivers know what they are doing, other boaters assume you know what you are doing.

As a responsible yachtsman, you will comply with the "Rules of the Road", the marine traffic laws enforced by the U.S. Coast Guard. There are two sets of rules: The United States Inland Navigational Rules and the International Rules. The United States Inland Rules apply to all vessels inside the demarcation line separating inland and international waters. The Coast Guard publishes the "Rules of the Road" in its publication "Navigational Rules, International-Inland." You can get a copy from [www.uscgboating.org](http://www.uscgboating.org), [www.navcen.uscg.gov](http://www.navcen.uscg.gov) or from your local U.S. Coast Guard Unit or the United States Coast Guard Headquarters, 1300 E Street NW, Washington, D.C. 20226.

### 4.2.5 Safety Equipment

*IMPORTANT: Federal law requires the owner/operator to provide and maintain safety equipment on your boat. Consult your Coast Guard, state, and local regulations, to ensure your boat has all required safety equipment on board. Additional equipment may be recommended for your safety and that of your passengers. Make yourself aware of its availability and use.*

If your boat is configured to American specifications, we have installed or provided the following safety equipment



in your Loose Gear Kit:

- (3) Smoke Detectors
- (3) CO Detectors
- (1) US Coast Guard Pamphlet

### 4.2.6. Additional Suggested Equipment

You should consider having additional equipment on board to help make your boating experience safer and more enjoyable. Some examples include the following:

- Boat hook
- Bucket & Sponge
- Commonly used spare parts
- Distress signal kit
- Docking lines
- Extra keys
- Extra V-belts
- Fenders
- Fire extinguishers
- First aid kit
- Flashlight & extra batteries
- Manually operated bilge pump
- Navigational charts
- Replacement bulbs
- VHF radio
- Spare fuel and oil filters
- Tool kit

### 4.2.7 Personal Flotation Devices (PFDs)

Within U.S. waters, there must be one U.S. Coast Guard approved wearable Personal Flotation Device (PDF) of Type I, II, or III for each person on board your boat. The PFDs must be in serviceable condition and readily accessible. The Coast Guard requires a minimum of three PFDs (two wearable and one throwable) regardless of the number of persons on board.

When sailing outside U.S. waters, determine and comply with the requirements of the home country for their home waters or by their international agreement for the open seas.

#### (A) PFD Type I, Wearable:

This offshore life jacket has the greatest buoyancy. It is effective for all waters where rescue may be delayed. Its design allows for turning most unconscious persons in the water from face down position to a vertical or face-up position.

#### (B) PFD Type II, Wearable:

This near-shore buoyant vest provides less buoyancy than a Type I PFD. It is intended for calm inland waters or waters where there is a chance of quick rescue. It turns its wearer to a face-up position as does the Type I PFD, but the turning action is not as pronounced as the Type I, and it will not turn as many persons under the same conditions as a Type I.

#### (C) PFD Type III, Wearable:

Classified as a flotation aid, this PFD allows wearers to place themselves in a vertical or face-up position in the water. Type III PFD has the same minimum buoyancy as a Type II PFD. It has little or no turning ability. People participating in water sports often prefer this PFD because it is intended for use in waters where quick rescue is possible and it is generally the most comfortable for continuous wear.

#### (D) PFD Type IV, Throwable:

You must also have aboard at least one throwable PFD Type IV device. The Type IV device can be thrown to a person in the water and held by the user until rescued. The design does not allow it to be worn. The most common Type IV PFD are buoyant cushions or ring buoys. This PFD must be immediately available for use and in serviceable condition.

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## 4.3 Carbon Monoxide Hazard

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***IMPORTANT:** See the NMMA brochure included with your OEM manuals concerning Carbon Monoxide poisoning and its prevention.*

As all responsible yachtsmen know, there are unseen dangers when boating. One danger is serious enough to warrant a lengthy discussion. CARBON MONOXIDE (CO) is an odorless, colorless, and tasteless gas which can be harmful or fatal if inhaled.

### 4.2.1 Carbon Monoxide Safety

Carbon Monoxide accumulation is affected by boat geometry, hatching, windows, door openings, ventilation openings, proximity to other structures and boats, wind direction, boat speed, boat maintenance, and a multitude of other variables. Therefore, CO prevention and detec-

tion should be top of mind.

### 4.2.2 What is Carbon Monoxide?

Carbon Monoxide is a highly poisonous gas formed by the combination of carbon and oxygen. Commonly referred to as CO, its chemical formula is C for carbon and O for oxygen. CO is a colorless, odorless, and tasteless gas that, by itself, cannot be detected by human senses. CO diffuses in the air much more rapidly than other gasses that are detectable by the human senses. The weight of CO is about the same as air so it does not rise or fall like other gasses but will distribute itself throughout the boat. CO is produced any time a material containing carbon is burned. In boating, these materials include, but are not limited to, gasoline, diesel fuel, and propane. All carbon based fuels produce varying amounts of CO, depending on their carbon content. Gasoline is high in carbon and, therefore, produces higher levels of CO. However, the exhaust of all engines and generators as well as any open flame device, produce CO therefore the same precautions should be taken regardless of the type of fuel.

The best way to avoid and respond to a Carbon Monoxide emergency is to understand the causes, recognize the symptoms and receive training in emergency care.

### 4.2.3 How Carbon Monoxide Can Enter Your Boat

Any device that burns fuel creates Carbon Monoxide. For example, a propane cook-top or a space heater are both potential sources for CO. But the most serious danger comes from the engines and generators aboard your own and neighboring boats. There are four basic ways that CO can enter your boat from a running engine or generator. See "Know the Dangers" page in this chapter for details.

### 4.2.4 Symptoms of Carbon Monoxide Poisoning

One or more of the following symptoms can signal the adverse effects of Carbon Monoxide accumulation. The order of this list is generally the sequence in which symptoms occur. However, the number of symptoms and the order of their appearance may vary between different people and circumstances.

**Watering and Itching eyes**  
**Tightness in the chest**  
**Flushed Appearance**  
**Ringing in the ears**  
**Throbbing Temples**

**Inattentiveness**  
**Convulsions**  
**Drowsiness**  
**Headache**  
**Dizziness**  
**Vomiting**  
**Collapse**  
**Nausea**  
**Fatigue**

Being trained to identify and treat symptoms of CO poisoning is strongly recommended.

### 4.2.5 Effects of Carbon Monoxide

When inhaled, Carbon Monoxide is absorbed by the lungs and reacts with the blood hemoglobin to form carbon hemoglobin, which reduces the oxygen carrying capacity of the blood. The result is a lack of oxygen for the tissues, causing subsequent tissue death and, if prolonged, death of the individual. Carbon Monoxide in high concentrations can be fatal in a matter of minutes. Even lower concentrations must not be ignored because the affects of exposure to CO are cumulative and can be just as lethal. Certain health related problems and age increases the effects of CO. People who smoke or are exposed to high concentrations of cigarette smoke, consume alcohol, or have lung or heart disorders are particularly susceptible to an increase in the effects from CO exposure. However, the health of all of the boat's occupants should be considered. Physical exertion accelerates the rate at which the blood absorbs CO. The early effects of CO poisoning are easy to overlook because they are similar to the effects of other boating related stress such as eye strain, fatigue, sun exposure, seasickness, or alcohol consumption. But, as the concentration of CO in the air increases, it has increasingly adverse effects on your health.

### 4.2.6 When Overcome by Carbon Monoxide

When someone falls victim to Carbon Monoxide poisoning, fast and responsive action is crucial. Know the symptoms. The earlier the effects of CO are detected, the better the chances for recovery. The following list shows the sequences of events that must be done in an effort to revive a CO victim: Evacuate, Ventilate, Investigate, Treat.

Complete the Carbon Monoxide poisoning action sequence:

- Move the victim to fresh air.
- Administer oxygen if available. If the victim is not breathing, perform artificial resuscitation per approved CPR procedures until medical help arrives and takes over. Prompt action can mean the difference between life and death.
- Ventilate the area.
- Investigate and identify the source of CO.
- Treat the source of the problem by taking corrective action.

As always, you can contact the Red Cross to obtain information for training in CPR or emergency response care.

### 4.2.7 How to Minimize the Accumulation of Carbon Monoxide

Practice good inspection and maintenance habits. Be certain hull exhaust outlets are not blocked or restricted in any way.

Be alert for exhaust gasses from other boats. Always provide adequate ventilation when weather enclosures are in place and engines or generator are running.

Do not run with a high bow angle. Use trim tabs or redistribute the load to maintain a low bow angle. Orient your boat to maximize the dispersion of CO.

We cannot identify or describe every possible variable or combination of variables, you must continually observe passengers for symptoms or Carbon Monoxide intoxication and be aware of the many possibilities of Carbon Monoxide accumulation. For instance, poorly maintained hoses and hose connections on the generator or engine exhaust system(s) can permit Carbon Monoxide to escape into the interior of your boat. Therefore, the exhaust system must be periodically examined and maintained in order to ensure its integrity. Moreover, all accommodation spaces constantly require proper ventilation.

### 4.2.8 Preventative Maintenance

Frequent inspections and proper maintenance of the engines and exhaust system, as well as other various areas of your boat, are critical in preventing the accumulation of Carbon Monoxide. It is the owner's responsibility to make sure the entire boat is inspected and maintained to prevent possible CO accumulations.

The exhaust systems of your engines and generator are under constant attack from salt water, gasses, vibra-

tion, and normal wear. Inspect every exhaust system component often. Start with a visual inspection. Check each joint for discoloration, carbon buildup, stains, water leaks, or other signs of damage. Inspect all metal parts for corrosion, discoloration, or flaking. Check that all hose clamps are in good condition and properly tightened. Carefully inspect all exhaust and cooling hoses for signs of wear, dry rot, cracking, discoloration, chafing, or swelling. If any of these conditions exist, have the entire system inspected and corrected by a qualified technician before starting the engines or generator.

Next, start each engine and generator one at a time. Inspect the full run of the exhaust system, listening and looking for leaks. While doing this, make sure there is adequate ventilation and that your CO detector is on.

Other items to inspect are as follows:

- If your boat has access panels, check that the access panels around the engine and exhaust are in place and fit snugly to minimize the opportunity for CO to enter the cabin. There should be no large openings where CO could enter the cabin.
- Ensure that all ventilation systems are in good working order and are not blocked or punctured.
- Check all sink drains to assure that they have a good water trap to prevent CO from coming in from the outside.

Finally, because poorly running engines produce excessive CO, make sure engines and generators are tuned up. They should run smoothly and not produce black smoke. The spark plugs (gas engines) and ignition systems should be regularly maintained as per the manufacturer's maintenance schedules, and the fuel system and air filters should be in good order.

### 4.2.9 Carbon Monoxide Detectors

If you carefully avoid potential CO accumulation and maintain your systems properly, you have made great strides towards protecting yourself and others from the dangers of Carbon Monoxide. For further protection, CO detectors have been installed in each living area aboard your boat and are UL approved for marine use. Most CO detectors require specific maintenance procedures to remain accurate and functional. Follow the manufacturer's instructions for the use and maintenance of the CO detectors.

It is strongly recommended that you change CO and Smoke alarm batteries when changing the clocks for

# Know the Dangers!



Exercise caution when swimming near or under the back deck or swim platform. Carbon monoxide from exhaust pipes of inboard engines, outboard engines and generators build up inside and outside the boat in areas near exhaust vents.

STAY AWAY from these exhaust vent areas and DO NOT swim in these areas when the motor or generator is operating. On calm days, wait at least 15 minutes after the motor or generator has been shut off before entering these areas. NEVER enter an enclosed area under a swim platform where exhaust is vented, not even for a second.

**It only takes one or two breaths of the air in this “death chamber” to be fatal.**

Blockage of exhaust outlets can cause carbon monoxide to accumulate in the cabin and cockpit area - even when hatches, windows, portholes, and doors are closed.

Exhaust from another vessel that is docked, beached, or anchored alongside your boat can emit poisonous carbon monoxide gas into the cabin and cockpit of your boat. Even with properly vented exhaust, your boat should be a minimum of 20 feet from the nearest boat that is running a generator or engine.

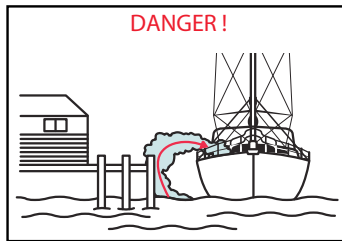
Slow speeds or idling in the water can cause carbon monoxide gas to accumulate in the cabin, cockpit, bridge, and aft deck, even in an open area. A tailwind (force of wind entering from aft section of the motorboat) can also increase accumulation.

The “station wagon effect,” or backdrafting can cause carbon monoxide to accumulate inside the cabin, cockpit, and bridge when operating the boat at a high bow angle, with improper or heavy loading or if there is an opening which draws in exhaust.

This effect can also cause carbon monoxide to accumulate inside the cabin, cockpit, aft deck, and bridge when protective coverings are used and the boat is underway.

Teak surfing, dragging and water-skiing within 20 feet of a moving watercraft can be fatal.

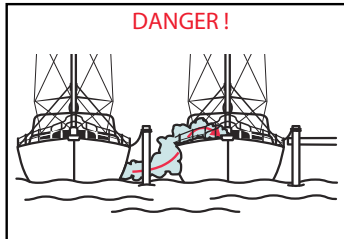
D



Moored to pier blocking exhaust!

**Figure 4.3.** Blocked hull exhaust outlets near a pier, dock, seawall, bulkhead or any other structure can cause excessive accumulation of Carbon Monoxide gas with the cabin areas of your boat. Be certain hull exhaust outlets are not blocked in any way.

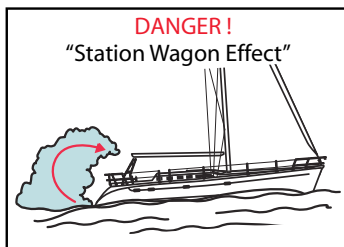
A



Exhaust from other vessels moored alongside!

**Figure 4.4.** Engine and generator exhaust from other vessels alongside your boat, while docked or anchored, can cause excessive accumulation of Carbon Monoxide gas within the cabin and cockpit areas of your boat. Be alert for exhaust from other vessels.

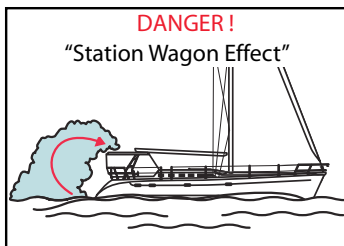
N



Caused by high bow angle!

**Figure 4.5.** Engine or generator exhaust from your boat while underway and operating with a high bow angle can cause excessive accumulation of Carbon Monoxide gas within the cabin and cockpit areas of your boat. Always provide adequate ventilation and redistribute the load to lower the boat angle.

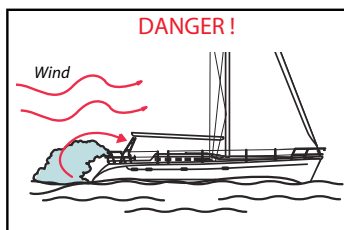
G



With protective coverings in place!

**Figure 4.6.** When protective weather coverings are in place, engine or generator exhaust from your boat, while docked and/or running, can cause excessive accumulation of Carbon Monoxide gas within the cabin and cockpit areas of your boat. Always provide adequate ventilation when the weather coverings are in place and either the engine or generator are running.

E



Slow speed, idle, or wind!

**Figure 4.7.** While underway or drifting slow speed can cause CO buildup, add a tailwind and this can intensify the effect.

R

Daylight-Saving Time. **Replace Smoke Alarms every 10 years and replace Carbon Monoxide (CO) alarm every 5 years** since the sensors in these devices can degrade because of environmental contamination and age. In addition, conduct monthly testing to ensure the proper operation.

In general, learn how to use your detectors, how they work, what the alarm signals are and what your response should be. A working detector can save lives. It's that simple and that important.

### **If the CO detector alarm sounds:**

1. Press the Reset/Silence button.
2. Call Emergency Services.
3. Immediately move to fresh air, outdoors, or to an open window or door. Do a head count to check that all persons are accounted for. Do not re-enter the premises nor move away from an open door or window until the emergency responders have arrived, the premises have been aired out, and your alarm remains in its normal operation.
4. After following steps 1, 2, and 3, if your alarm reactivates in a 24 hour period, repeat steps 1 – 3 and call a qualified appliance technician.

### **Where to Install Alarms**

- For minimum protection, CO alarms should be installed near all sleeping areas.
- For maximum protection, CO alarms should be installed in all sleeping areas.

### **Where not to Install Alarms**

- Not behind furniture, drapes, closets, or areas that will block air flow to the alarm.
- Not within 12 inches of window openings, exterior doors, heating or return air vents, or any other drafty areas.
- The alarm should not be located within 5 (1.5 m) feet of any cooking appliance.

*NOTE: Consult the CO detector manufacturer's OEM manual for detector operation, care and maintenance.*

### **Limitations of the CO alarm**

Carbon Monoxide alarms will not work without power. Power loss can occur from a blown or missing fuse, broken wire, faulty connection, tripped circuit breaker or a discharged battery. Refer to the DC Electric chapter in this manual for details on powering your CO detectors.

This alarm will only detect the presence of CO gas at the sensor. Carbon Monoxide gas may be present in other areas.

Carbon Monoxide alarms may not be heard. The alarm loudness is designed to meet or exceed the regulatory standards. However, the alarm may not be heard if alarms are located in remote locations or behind closed doors. The alarm may not be heard by persons who are hard of hearing, have consumed alcoholic beverages, taken prescription or non-prescription medication or illegal drugs.

This alarm is designed to detect Carbon Monoxide from any source of combustion. It is not designed to detect smoke, fire, or any other gasses. The alarm may not sound at low Carbon Monoxide levels. This product is intended for use in ordinary indoor locations of living spaces. It is not designed to measure compliance with Occupational Safety Health Administration (OSHA) commercial or industrial standards. Individuals with medical problems may consider using warning devices which provide audible and visual signals for levels under 30 PPM.

If you purchase replacement or additional CO detectors, ensure they are UL approved for marine use.

### **4.2.10 Carbon Monoxide Review**

Everyone is at risk for Carbon Monoxide poisoning. Particularly sensitive are children, pregnant women, the elderly and people with lung disease, heart disease, or anemia.

WHY? Because Carbon Monoxide is an odorless, colorless gas that prevents the blood from carrying oxygen to the vital organs. CO (Carbon Monoxide) is 200 times more likely to replace oxygen in the blood.

Memorize the symptoms of Carbon Monoxide poisoning noted in this chapter so you will be able to immediately recognize these symptoms should they ever arise.





## Boating Safety

Mild Exposure	100 – 400 PPM (parts per million)	causes headaches and fatigue resembling the flu.
Medium exposure	400 – 800 PPM	causes severe headaches, drowsiness, nausea, and rapid heart rate.
Extreme exposure	over 800 PPM	results in unconsciousness, convulsions, heart or respiratory failure, and death.

Many reported cases of Carbon Monoxide poisoning determined that, while victims are aware they are not well, they become so disoriented they are unable to save themselves by either exiting the building or calling for assistance. Also, children and pets may be affected first.

Carbon Monoxide gas is produced when any type of fuel is incompletely burned. Fuel burning engines and appliances (furnace, fireplace, oven, stove, water heater, etc.) also space heaters, gas and charcoal grills produce CO.

Extended operation of unvented fuel burning appliances (range, oven, fireplace, etc.) can build up high CO levels.

Make regular visual inspections of all fuel burning equipment including gas stoves and engines. Make regular inspections of the engines and generator exhaust systems. Cracked exhaust systems can allow Carbon Monoxide to enter the living area.

Professionally maintain your engine and generator. Although all fuel burning engines and generators produce Carbon Monoxide, a poorly tuned engine and generator will produce relatively more.

Ensure alarms are installed properly. Carefully read and follow ALL the instructions in this manual. Test your unit every week. Alarms that do not work will not alert you to the presence of Carbon Monoxide.

DO NOT attempt to test the alarm by any other means than by using the Test/Reset button.

DO NOT attempt to produce CO to test the alarm. The Test/Reset button tests all functions of the alarm and is the only safe way to be sure the alarm is working properly.



**CO alarms will only indicate the presence of Carbon Monoxide gas at the sensor. Carbon Monoxide gas may be present in other areas. To reduce the risk of Carbon Monoxide poisoning, test the alarm's operation after the boat has been in storage, before each trip, and once a week during use.**



**Actuation of your CO alarm indicates the presence of Carbon Monoxide (CO) which will KILL YOU!**

### 4.4 Other Potential Dangers

#### 4.4.1 Weather

Storms rarely appear without some advanced notice. Check the weather forecast before you begin your boat outing. Be aware, however, that weather conditions can change rapidly. If you have a marine radio, listen to the weather reports issued by the U.S. Coast Guard and others. If you have a portable radio, keep it tuned to a station broadcasting frequent weather reports. Many boating clubs fly weather signals. Learn to recognize these signals and listen to your local forecasts before leaving port.

Your surroundings can also be a good indicator of changing weather conditions. Watch for changes in wind direction or cloud formations. There is no substitute for a good understanding of weather conditions and what to do when the weather takes a turn for the worse.

See Figure 4.6, Lighting Storm Warning, for an explanation of the dangers of lightning strikes, with an overview of your protection area.

Refer to Chapman Piloting and Seamanship for instructions and precautions in operating a craft in adverse conditions.

#### 4.4.2 Fog

You can judge the likelihood of fog formation by periodically measuring the air temperature and the dew point temperature. If the difference between these two temperatures is small, fog is likely to develop.

Foggy conditions include mist, snowstorm, or heavy

rain.

Avoid operation in such weather, especially if your boat is not equipped with radar.

### 4.4.2.1 Remember these fog safety guidelines:

- Unless your boat is well equipped with charts, head for shore at the first sign of fog and wait until conditions improve. If you have charts on board, take bearings as fog sets in, mark your position, and continue to log your course and speed.
- Make sure all persons on board are wearing their personal flotation devices (PFDs). If your boat has sounding equipment, take soundings regularly and match them with known depths on your charts.
- Station a person forward in the boat as a lookout.
- Reduce your speed. From time to time, stop engines and listen for other fog signals.
- Sound the horn or bell at approximately 2 minute intervals.
- If there is any doubt about continuing your excursion, anchor. Listen for other fog signals while continuing to sound your fog horn.

### 4.4.3 Drugs and Alcohol

Drugs and alcohol affect a person's ability to make sound judgments and react quickly. As a responsible boater, one should refrain from using drugs or alcohol while operating one's boat. Operation of motorized vessels while under the influence carries a significant penalty. Drugs and alcohol decrease your reaction time, impair your judgment and inhibit your ability to safely operate your boat.

### 4.4.4 Collision

If a serious collision occurs, first check the persons on board for injuries. Then inspect the boat to determine the extent of the damage.

Prepare to help the other craft unless your boat or its passengers are in danger.

Prepare to help the other craft if your bow penetrated the

other boat or its passengers are in danger.

If the bow of the other boat penetrated your boat's hull, prepare to plug the fracture once the boats are separated.

Refer to the Documents and Forms chapter in this manual for a discussion on accident reporting.

### 4.4.5 Running Aground

If your boat runs aground, check everyone for injury and inspect damage to the boat or propellers. If lightly grounded, shift weight of passengers or gear to heel the boat while reversing engines. If towing becomes necessary, we recommend using a commercial towing service.

### 4.4.6 Swamped or Capsized Boat

If your boat becomes swamped or capsized, put on a PFD immediately and set off a distress signal. Chances are good that a capsized boat will stay afloat. For this reason, stay with the boat. Do not leave the boat or try to swim to shore except under extreme conditions. A capsized boat is easier to see than a swimmer, and shore may be further away than it appears.

### 4.4.7 Falling Overboard

One of the most frightening emergencies that can occur aboard a boat is a crew member or yourself falling overboard. Although "man overboard" or "MOB" drills have been a part of boating safety for decades, they have been largely overlooked by many responsible boat owners.

Just as important as acquiring the knowledge to rescue a person is the ability to help yourself if you are the person overboard. Be sure and refer to [Chapman Piloting and Seamanship](#) for more information. It is packed with useful and essential safety and emergency procedures. To re-board, use the transom extension ladder.

### 4.4.8 Hypothermia

If a person falls overboard, hypothermia may be an immediate concern. Hypothermia means a person's body loses heat to the water faster than the body can replace it. If not rescued, the person will become exhausted and likely drown. In general, the colder the water, the shorter the time for survival (see chart below). PFDs will increase survival time because they provide insulation.



## Boating Safety

FOR REFERENCE ONLY (TIMES MAY VARY)

Water Temperature	Exhaustion or Unconsciousness	Expected Time of Survival
32.5	Under 15 min	Under 15 to 45 min
32.5 – 40	15 – 30 min	30 – 90 min
40 – 50	30 – 60 min	1 – 3 hrs
50 – 60	1 – 2 hrs	2 – 4 hrs
60 – 70	2 – 3 hrs	2 – 4 hrs
70 – 80	3 – 12 hrs	3 hrs – indefinite
Over 80	Indefinite	Indefinite

### 4.5 Fire



**A fire aboard your boat is serious. Explosion is possible and can result in significant property damage, personal injury or death. Respond immediately. Develop a fire response plan.**

Every boater should develop a fire response plan to determine what kind of fire (fuel, electrical, etc.) might break out, where it might break out, and the best way to react.

**IMPORTANT:** *Everyone on board should know where a fire extinguisher is and how to operate it.*

In the event of a fire, consider the following guidelines:

1. Any fire requires stopping the engines immediately.
2. Keep the fire downwind if possible. If the fire is aft, head into the wind.
3. Have all persons on board put on their personal flotation devices (PFDs).
4. If you can get at the fire, aim the fire extinguisher at

the base of the flames and use a sweeping action to put out the fire.

5. If the fire gets out of control, make a distress signal and call for help on the radio.

Deciding whether to stay with the boat or abandon ship will be difficult. If the decision is to abandon ship, all persons on board should jump overboard and swim a safe distance away from the burning boat.

#### 4.5.1 Engine Compartment Fire

An optional halon fire extinguisher system is available for your boat (Fig. 4.1) which operates automatically to extinguish a fire in the engine compartment.

When a fire is detected on your boat, the automatic system will sound an alarm, discharge the extinguisher and illuminate the “Discharge” LED on the remote panel (see the DC System chapter in this manual). The relay will shut down the engine, the blower (see Waste System chapter in this manual) and the optional generator.



Figure 4.1

When discharging, a loud sound (similar to that of small arms fire) followed by a “rushing” air sound indicates activation of the extinguisher. If the discharge light activates or if you hear the extinguisher discharging, proceed as follows:

- Be aware the activated automatic fire system will automatically shut down the engine and the blower.
- Evacuate all occupied enclosures immediately. If practical, evacuate the boat.
- Do not run the blower.

## Boating Safety

- Do not open the engine compartment hatches. Allow the halon fire extinguisher to soak the compartment for at least fifteen minutes.
- Wait for hot metals and fuels to cool before inspecting for damage or cause of fire.
- Open engine compartment slowly. Have approved portable fire extinguisher at hand and ready for use.

Do not breathe fumes or vapors caused by fire. HALON FUMES ARE TOXIC!

### **DANGER**

**Flash fire erupting from the engine compartment can burn you. Opening the engine compartment access panels will feed oxygen to the fire and cause the fire to flash back. Keep engine compartment hatches closed for at least 15 minutes after fire extinguisher discharges.**

Frequently check the extinguisher's green section of the pressure gauge and ensure the pressure indicator is in the normal range.

### **CAUTION**

**In the event of an automatic extinguisher discharge, do not open the engine compartment hatches. The protected space must be kept closed for at least 15 minutes to allow the fire to be extinguished and surfaces cooled sufficiently to prevent reflash.**

*NOTE: Consult the automatic fire extinguisher system manufacturer's OEM manual for specifics on system operation and*

*maintenance.*

## 4.6 Distress Signals

### 4.6.1 Mayday

If you have a VHF radio, heed storm warnings and answer any distress calls from other boats. The word "MAYDAY" spoken three times is the international signal of distress. Monitor marine radio channel 16, which is reserved for emergency and safety messages. You can also use this channel to contact the Coast Guard or other boaters if you have trouble.

*NOTE: Never send a "MAYDAY" message unless there is a serious emergency and you are in need of immediate assistance.*

### 4.6.2 Visual Distress Signals

The U.S. Coast Guard requires that all boats operating on U.S. Coastal Waters have visual distress signal equipment on board. In general, coastal waters include all waters except rivers, streams, and inland lakes. The Great Lakes are considered coastal waters, as is a river mouth more than two miles wide. Boats owned in the United States or non-U.S. owned boats operating in home waters of other countries must comply with the home country's requirements for visual distress equipment.

The U.S. Coast Guard requires visual distress equipment must be in serviceable condition and stowed in a readily accessible location. Equipment having a date showing

## LIGHTING REQUIREMENTS

Vessel	Notes	Lights	Less than 12 meters (39ft.)	12 (39ft.) meters to less than 20 (65 ft.) meters
Power	This includes sailing vessels under power and motor sailing	White Masthead Light	2 NM (3.7 km) see note	3 NM (5.6 km)
		Sidelights or combination lights	1 NM (1.9 km)	2 NM (3.7 km)
		sternlight	2 NM (3.7 km) see note	2 NM (3.7 km)
Sail	Sailing Vessels under sail alone	Sidelights or combination lights	1 NM (1.9 km)	2 NM (3.7 km)
		sternlight	2 NM (3.7 km) see note	2 NM (3.7 km)

Figure 4.2

## Boating Safety

useful service life must be within the specified usage date shown. Both pyrotechnic and non-pyrotechnic equipment must be U.S. Coast Guard approved.

Pyrotechnic U.S. Coast Guard approved visual distress signals and associated equipment include: red flares, handheld or aerial orange smoke, hand held or floating launchers for aerial red meteor or parachute flares. Non-pyrotechnic equipment includes an orange distress flag, dye markers, and an electric distress light.

No single signaling device is ideal under all conditions for all purposes. Consider carrying various types of equipment. Careful selection and proper stowage of visual distress equipment is very important. If young children are frequently aboard, you should select devices with packages which children, but not adults, will find difficult to open.

Other helpful publications available from the U. S. Coast Guard include "Aids to Navigation" (U.S. Coast Guard pamphlet #123), which explains the significance of various lights and buoys, the "Boating Safety Training Manual", and "Federal Requirements for Recreational Boats". Check with your local Coast Guard Station, your dealer, or a local marina about navigational aids unique to your area.

### 4.6.3 Running and Navigation Lights

Your boat must have running and navigation lights for safe operation after dark. Observe all navigation rules for meeting and passing. Do not run at high speeds during night operation. Always use common sense and good judgment.

Operating at night can present some special challenges. Not only is your depth perception lessened, bright lights on the shore can cast misleading reflections on the water and if you wear glasses, or worse yet, bifocals, you simply don't see as well at night as you do during the day. It is not only important that you be able to identify other vessels operating in your proximity, it is equally important that other vessels see you. Most recreational vessels are less than 30 feet in length and, according to "The Rules of the Road", shall be equipped with navigation lights. These lights not only have a certain arc through which they can be seen but must be seen from a minimum distance. See Figure 4.2 for lighting requirements for recreational vessels.

The arc of the lights and color allows you to determine the

direction a vessel is moving (Fig. 4.3). How good are your lights? You should test them to see how visible you might be at night. Whether on a trailer or at the marina, switch on your lights and see how well they can be seen.

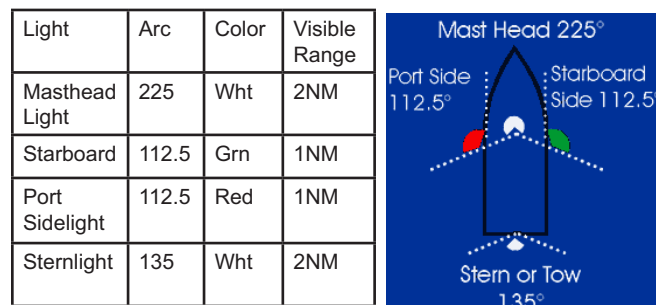


Figure 4.3

Walk or row away from the boat, if you are at anchor or at a mooring, and see how visible the lights are as you move further away. How easy are they to see against the background of lights on shore?

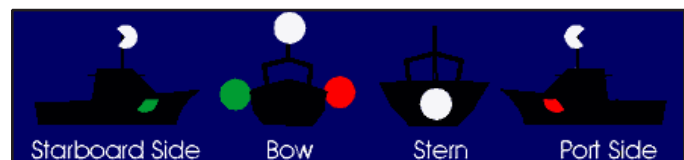


Figure 4.4

It is allowable to have a 360 degree mast light. This mast light, in conjunction with the side lights, will indicate the boat's orientation (Fig. 4.4).

Check your sidelights from dead ahead. You should see both red and green. However, by moving toward one side by 1-3 degrees, you should then see only one light. If you still see two lights, an approaching vessel won't be able to tell which direction you are going.

When boating at night, remember the old saying: "When two lights you see ahead, turn your helm and show your red."

### 4.6.4 Sound Signaling Device

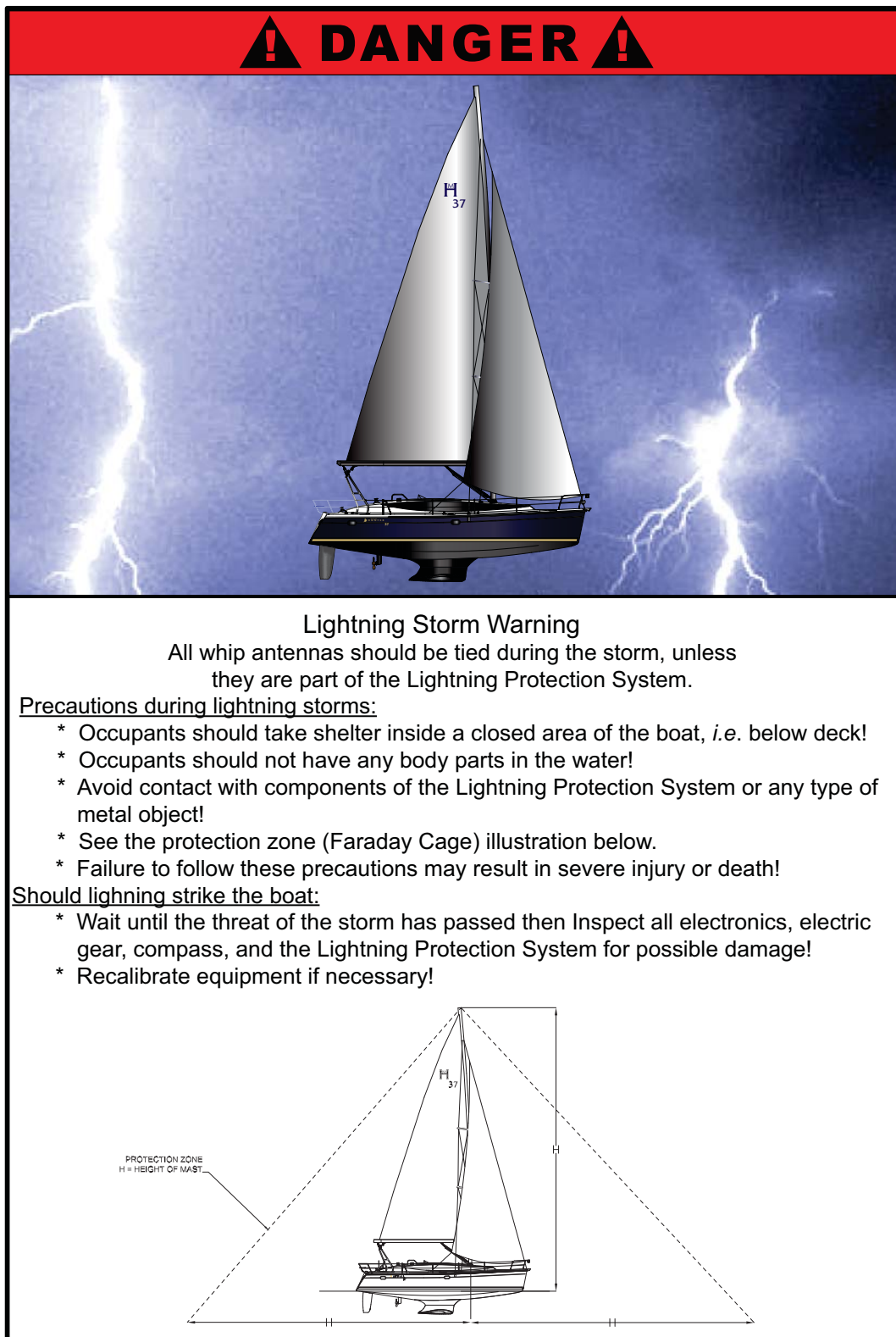
Your boat is provided with a power operated horn which conforms with U.S. Coast Guard requirements for boats of this size. All class A boats are recommended to carry a hand or power operated whistle or power operated horn. The device should be used to promote safe passing as a warning to other vessels in fog, or confined areas, or

as a signal to operators of locks or drawbridges. Refer to Fig. 4.5 for a summary of blasts and their meanings.

### **BLAST SIGNALS AND MEANINGS**

One Prolonged Blast	Warning Signal
One Short Blast	Pass on my port side
Two Short Blasts	Pass on my starboard side
Three Short Blasts	Engines in Reverse
Five or More Blasts	Danger Signal

**Figure 4.5**



Lightning photo courtesy of: National Oceanic and Atmospheric Administration/Department of Commerce

Figure 4.6

## MH31 SPECIFICATIONS

LENGTH OVERALL (LOA).....	32' 4".....	9.86 m
LENGTH OF HULL (LH).....	31' 11".....	9.73 m
LENGTH OF WATERLINE (LWL).....	29' 8".....	9.04 m
BEAM (MAX).....	11' 10".....	3.61 m
DRAFT		
SHOAL.....	4' 5".....	1.35 m
DEEP.....	5' 5".....	1.65 m
DISPLACEMENT		
SHOAL.....	12,000 lbs.....	5,443 kg
DEEP.....	11,854 lbs.....	5,377 kg
BALLAST		
SHOAL.....	3,525 lbs.....	1,599 kg
DEEP.....	3,379 lbs.....	1,533 kg
SAIL AREA		
FURLING.....	542 sq.ft.....	50.35 sq. m.
STANDARD.....	581 sq.ft.....	53.98 sq. m.
SAIL DIMENSIONS		
I.....	35' 9".....	10.90 m
J.....	11' 3".....	3.43 m
FURLING		
P.....	40' 11 3/4".....	12.49 m
E.....	14' 7".....	4.45 m
STANDARD		
P.....	36' 5 1/2".....	11.11 m
E.....	13' 10".....	4.22 m
MAST HEIGHT (FROM WATERLINE)		
FURLING.....	51' 11".....	15.82 m
STANDARD.....	46' 7".....	14.19 m
WATER CAPACITY.....	50 US Gal.....	189 liters
HOLDING TANK CAPACITY.....	20 US Gal.....	76 liters
FUEL TANK CAPACITY.....	25 US Gal.....	95 liters
WATER HEATER.....	5 US Gal.....	19 liters
LPG TANK CAPACITY.....	2 x 4 lbs.....	2 x 1.81 kg
BATTERIES (HOUSE/START).....	2 x GROUP 31	
BATTERY CHARGER (STANDARD).....	30 AMP	
INVERTER (OPTIONAL).....	1,000 WATT	
TV (OPTIONAL).....	24"	
INBOARD ENGINES - STANDARD.....	21 HP.....	15.7 kw
INBOARD ENGINES - OPTIONAL.....	29 HP.....	21.6 kw
AIR CONDITIONING (OPTIONAL).....	16,000 BTU	
MAXIMUM LOADING.....	10 PEOPLE.....	1,040 kg
SLEEPING CAPACITY.....	SLEEPS 6	
HEADROOM.....	6' 2".....	1.88 m
CE CATEGORY.....	B	



## MH31 STANDARD FEATURES

### Rigging

Boom vang  
Internal halyards led to cockpit  
Jib furling system  
Jib, 110% furling with acrylic sun cover  
Jib tracks with adjustable cars  
Lazy jacks with standard mainsail  
Mainsail, full roach with flaking system  
Mainsheet purchase system  
Mast, B&R with fractional sail plan reefing system, dual single line led aft  
Rigging line stoppers and organizers, two sets winch handles (2)  
Winches, (2) self-tailing #16, halyard  
Winches, (2) self-tailing #30, jib  
Windex® wind vane

### Cockpit

Steering console with single lever engine control, wheel brake, lighted compass, space for instruments, and stainless steel wheel guard  
Bilge pump, manual  
Cockpit arch  
Cockpit table with fold out leaves  
Dual ended main sheeting  
Lewmar steering  
Lockers, (2) storage  
LPG storage locker  
Stern rail seats, stainless steel with drink holders  
Stern storage compartment for shore power  
Stern storage locker  
Walk-through transom with fold down swim platform and telescoping stainless steel ladder

### Deck / Hull

Anchor roller, single  
Anchor well with space for rode and chain  
Blister prevent technology – hull  
Bow pulpit, stainless steel  
Deck handrails, stainless steel  
Hatches, (2) opening deck, with screens  
Hull, FRP/Nida-Core sandwich above waterline, solid FRP bottom  
Hull, structural grid reinforcement  
Keel, shoal draft  
Lifelines, double with 3 gates and SS stanchions

Mooring cleats, (6) stainless steel  
Nonskid deck  
Ports, (4) opening, with screens  
Rubrail, with stainless steel insert  
Rudder, balanced spade, with stainless steel shaft  
Sliding companionway hatch  
Through-bolted hull/deck joint with rubrail  
Through-hull fittings, all bronze below waterline

### Forward Cabin

Cabin lighting  
Deck hatch, opening  
Designer bedding fabrics  
Electrical outlets, AC and DC  
Hanging lockers, (2) cedar-lined  
Mattress, foam  
Private forward cabin  
Smoke and carbon monoxide detectors  
Storage shelving against hanging lockers  
Under-berth storage space

### Aft Cabin

Berth, double with foam mattress  
Compartment storage space  
Designer bedding fabrics  
Electrical outlets, AC and DC  
Hanging locker  
Ports/ hatches, (2) opening with screens  
Seat for reading

### Main Salon

Cabin lighting  
Deck hatch, (1) opening with screens  
Deck side windows, fixed  
Deluxe cushion/fabric package  
Dinette table  
Electrical outlets, AC and DC  
Gloss finish “cherry” woodwork  
Handrails, hardwood on both sides  
Head compartment, enclosed with vanity & shower  
Engine access  
Selected hardwood trim  
Storage shelving

### Galley

Electrical outlets, AC and DC  
Corian® countertop

Fresh water system, pressurized, hot and cold  
Icebox  
Microwave  
Port, (1) opening, with screen  
Sink, single, stainless steel with cutting board  
Storage cabinets  
Storage drawers Storage shelving  
Stove, two burner LPG

### Head

Anti-bacterial gelcoat  
Marine head with manual pump  
Shower stall with adjustable shower head, seat and folding shower door  
Shower sump pump  
Stainless steel sink  
Storage compartments  
Vanity with Corian® countertop

### Systems/ Electronics

12-volt dc electrical system with breaker panel  
21hp Yanmar® diesel engine with two blade prop  
Alternator, 120-amp  
Battery box, engine start  
Battery box, house  
Battery charger  
Bilge pump, electric, automatic  
Engine panel, deluxe with alarms and hour meter  
Fresh water system, pressurized, hot and cold  
Galvanic isolator  
Gauges, tank for fuel, water, and waste  
Gravity drain holding tank  
LED lighting, interior  
Navigation light package  
NMMA certification on all systems  
Propane gas system for cooking  
Raymarine® i40 knot meter with log  
Raymarine® i40 depth sounder with alarm  
Shore power system, 120 volt with cord  
Sump pump, shower  
Water heater

## MH31 EXTERIOR DESCRIPTION

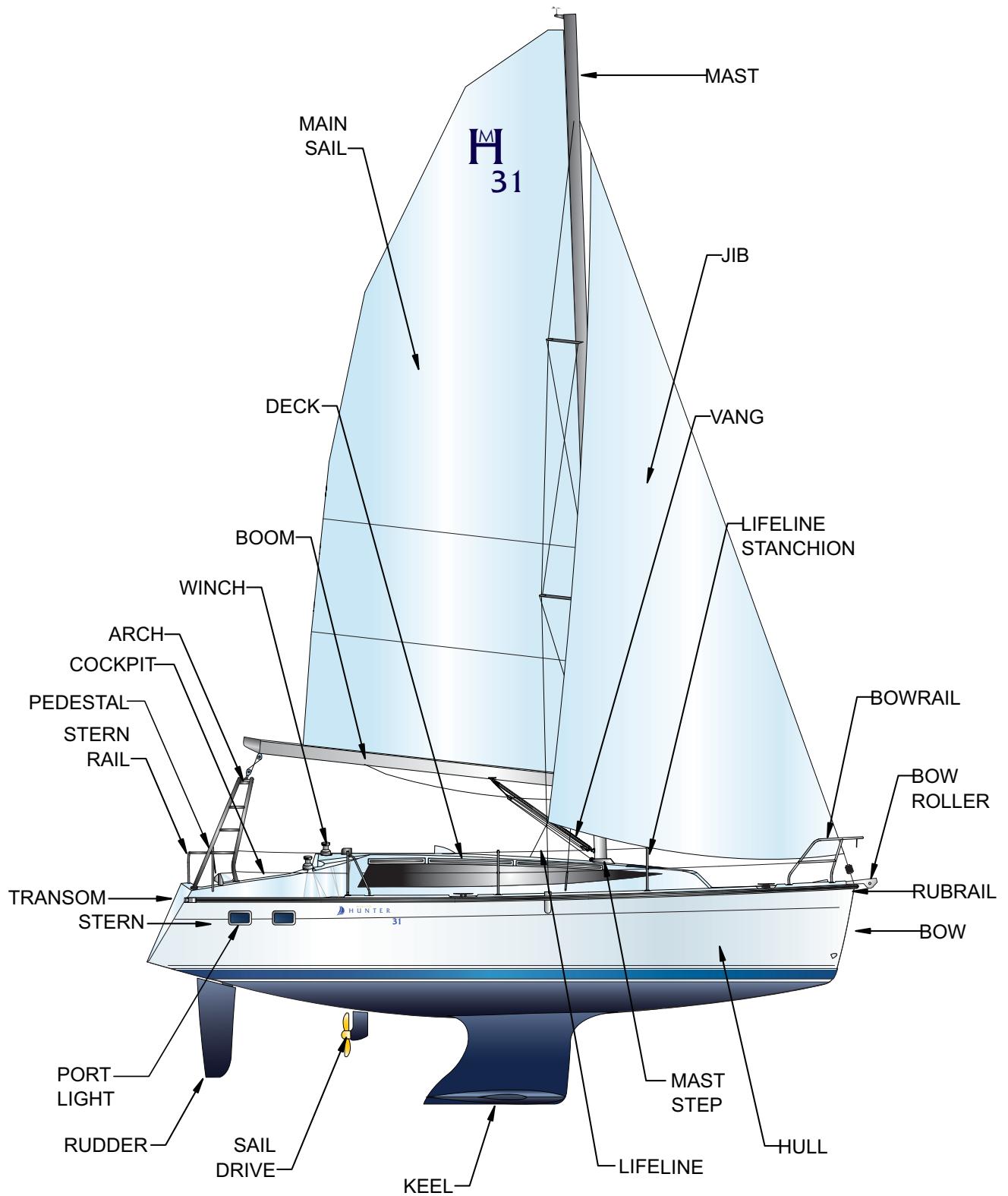


Figure 4.7



## MH31 INTERIOR ARRANGEMENT

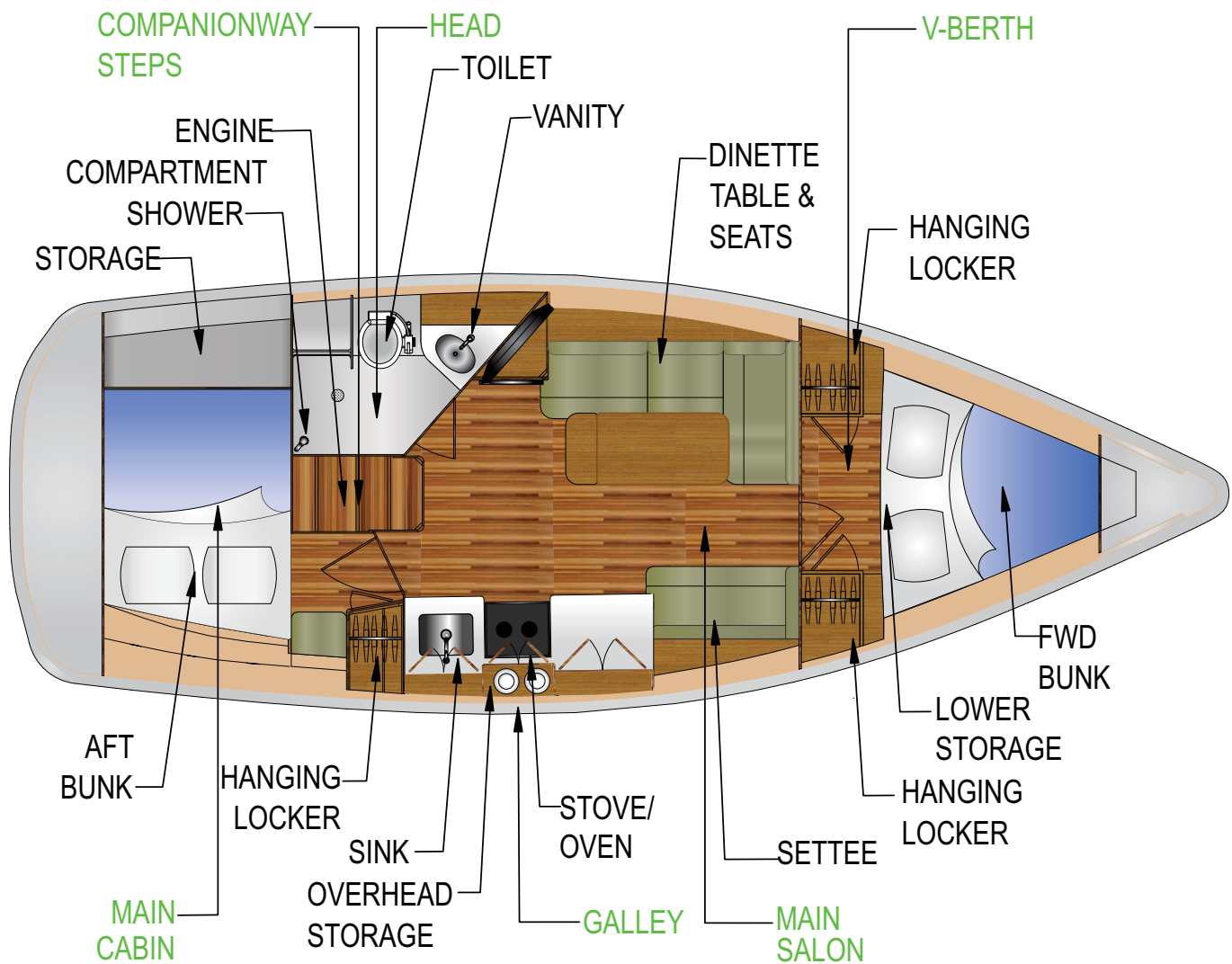


Figure 4.8

## MH31 DECK HARDWARE LAYOUT

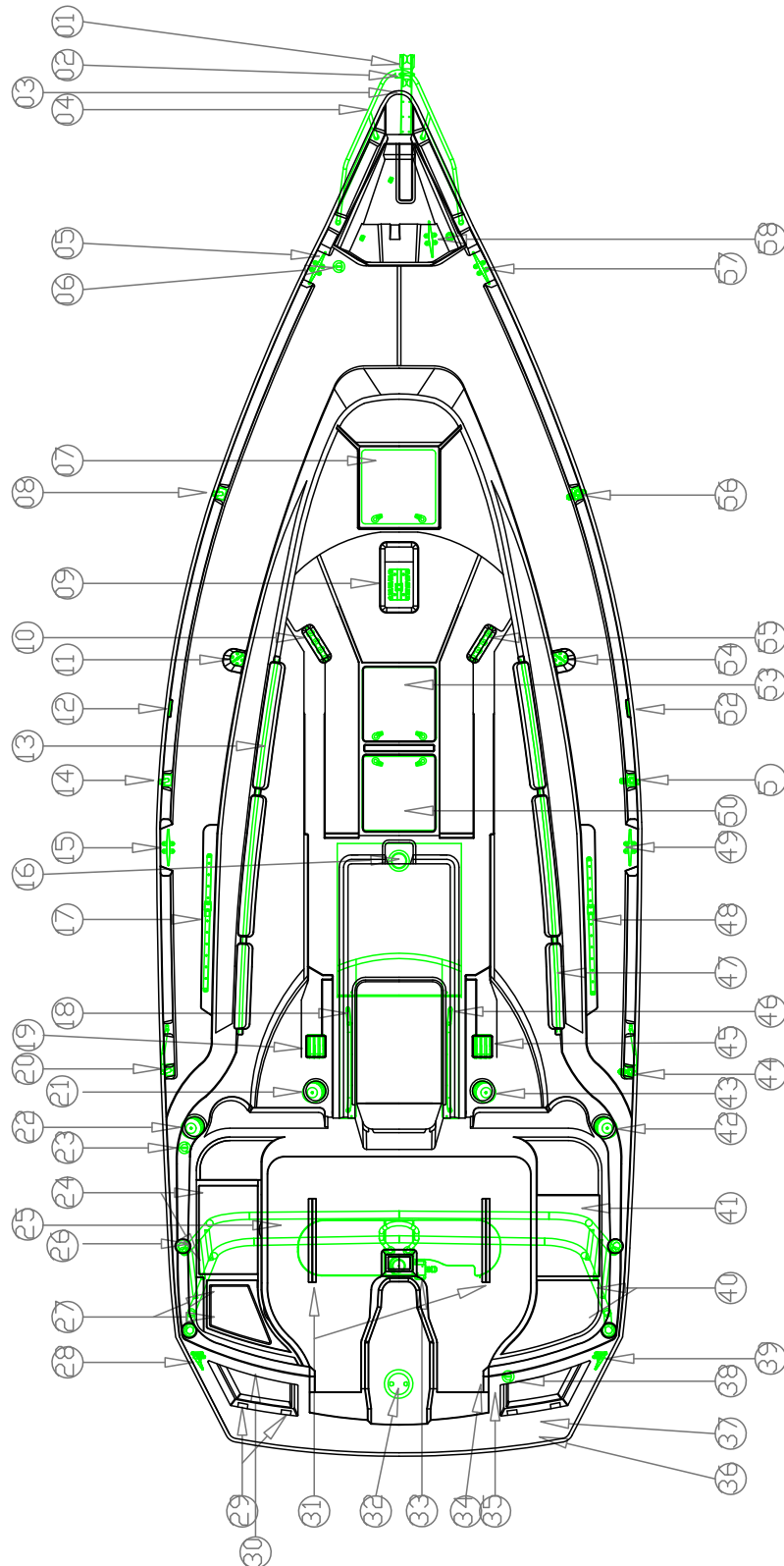


Figure 4.9

## DECK HARDWARE LIST

1	ANCHOR ROLLER	29	TRANSOM LOCKER HINGES (MIRRORED STBD)
2	BOW LIGHT	30	TRANSOM LOCKER LATCH (MIRRORED STBD)
3	SECONDARY ANCHOR ROLLER	31	FOOT RECESSES (MIRRORED STBD)
4	BOW RAIL	32	RUDDER POST INSPECTION PLATE
5	FORWARD CLEAT	33	THROTTLE ON CONTROL PEDESTAL
6	WATER TANK FILL	34	TAILGATE LIFTING HARDWARE
7	FORWARD EGRESS HATCH	35	STERN LIGHT LOCATION
8	STANCHION	36	TRANSOM GRABRAIL
9	MAST PLATE	37	SWIM LADDER
10	4X SHEET ORGANIZER	38	DIESEL FILL
11	INNER CHAIN PLATE	39	AFT CLEAT
12	OUTTER CHAIN PLATE	40	PROPANE LOCKER, HINGES AND LATCH
13	CABIN HOUSE HANDRAILS	41	AFT CABIN EGRESS HATCH
14	STANCHION	42	WINCH
15	MIDSHIP CLEAT	43	WINCH
16	DORADE VENT	44	STANCHION GATE
17	JIB TRACK AND JIB TRACK CAR	45	SHEET STOPPER
18	COMPANIONWAY SLIDER RAILS	46	COMPANIONWAY SLIDER RAILS
19	SHEET STOPPER	47	CABIN HOUSE HANDRAILS
20	STANCHION GATE	48	JIB TRACK AND JIB TRACK CAR
21	WINCH	49	MIDSHIP CLEAT
22	WINCH	50	AFT SALON HATCH
23	WASTE PUMP OUT FITTING	51	STANCHION
24	EURO LOCKER, HINGES AND LATCH	52	OUTTER CHAIN PLATE
25	MAINSHEET TRAVELER	53	FORWARD SALON HATCH
26	ARCH	54	INNER CHAIN PLATE
27	SEAT LOCKER, HINGES AND LATCH	55	4X SHEET ORGANIZER
28	AFT CLEAT	56	STANCHION
29	TRANSOM LOCKER HINGES (MIRRORED STBD)	57	FORWARD CLEAT
30	TRANSOM LOCKER LATCH (MIRRORED STBD)	58	ANCHOR LINE CLEAT

Figure 4.10

## AVAILABLE OPTIONS

Anchor, chain and line	Quiet-flush® head
Air conditioning system	Raymarine® AIS system
Automatic engine room fire extinguishing system	Raymarine® a95 MFD with GPS
Barrier coat, epoxy with bottom paint	Raymarine® e95 MFD with GPS
Bilge keel	Raymarine® radar
Bimini top	Raymarine® Smart Controller / wireless remote
Bottom paint	Raymarine® X5 autopilot
Cabin top winch upgrade to #30	Raymarine® i50 speed and depth upgrade
Cockpit cushions	Raymarine® wind machine
Colored Hull (Paint or Gelcoat)	Refrigerator and freezer
Cruise Ready Safety Package	Remote mic for VHF radio
Cruising spinnaker gear	Sail cover (standard main only)
Deep keel	Shade package
Diesel heating system	Sirius® receiver and antenna (U.S. only)
Dish setting package	Solid boom vang (included in furling main option)
Dodger	SmartPlug shore-power
Dura-Leather® cushion upgrade	Spinnaker gear
Electric anchor windlass	Steering: Adjustable wheel – port/starboard
Engine upgrade: 29hp Yanmar® with sail drive	Stereo: AM/FM, CD player in salon with Bose® speakers and cockpit arch pod with speakers
Generator	Transom shower, hot and cold
Helm sheeting package for jib with winches and tracks	Traveler, arch mounted for mainsheet
High bilge water alarm and pump	TV: Main salon – 24" flat panel with DVD player
In-mast furling system with rigid vang	Vertical battens for furling mainsail option
Inverter	VHF radio
Lewmar® folding steering wheel	
LPG Stove with oven	
Propeller, folding – two blade	

## Boating Safety

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## Boating Safety

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MARLOW-HUNTER, LLC

*Chapter 5*

# ***Fuel Systems***

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***MH31***



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## Fuel Systems

The fuel systems aboard your boat consist of two components: diesel for the engine and optional generator assemblies and LPG for the optional stove assembly. Our discussion will include the following topics:

1. Fuel Tank
2. Fuel Supply Lines and Hoses
3. Fuel Valves
4. Fuel Filters
5. Fueling Your Boat
6. LPG System

Refer to Fig. 5.10 at the end of this chapter for a fuel oriented quick reference checklist when boarding your boat. Also, refer to Fig. 5.11 - 5.12 for overall fuel system layout illustrations.

### 5.1 Fuel Tank

Your boat is equipped with a single 25 US gal (95 liter) fuel tank located beneath the aft cabin bunk and accessed through the starboard bunk drop-ins (Fig. 5.1).



Figure. 5.1

#### 5.1.1 Fuel Fill

The fuel tank is filled through the stainless steel deck-fill fitting located above the starboard transom garage door (Fig 5.2).



Figure. 5.2

#### 5.1.2 Fuel Tank Capacity Monitoring

The fuel tank is equipped with a fuel level sending unit (lower center component Fig. 5.1) which provides an electrical signal to the fuel gauge to indicate its fill level.

#### 5.1.3 Fuel Tank Grounding System

The fuel tank and deck fill on your boat are electrically grounded to the engine negative. This grounding system is designed to prevent the discharge of static electricity when fueling your boat. An authorized service technician should inspect this system at least once each year.

#### 5.1.4 Fuel Gauge

The fuel gauge is mounted on lower left corner of the safety panel located on the aft lower inboard face of the starboard cockpit seat (Fig. 5.3).

### ! DANGER !

Never place yourself near the engine compartment without proper ventilation first. A spark caused by power tools or lighting equipment could result in fire or explosion which could cause personal injury or death.

### ! WARNING !

Fuel leaking from any part of the fuel system can lead to fire and explosion that can cause serious bodily injury or death. Inspect system before fueling.

### ! CAUTION !

## Fuel Systems

**Using the wrong type of fuel will result in severe damage to the engines. Refer to your engine OEM manual for fuel recommendations.**

### **⚠ DANGER ⚠**

**Leaking fuel is a fire and explosion hazard. Personal injury or death could occur.**



Figure 5.3

### 5.1.5 Fuel Tank Vent

The fuel tank incorporates a thru-deck vent fitting and is located inboard of the starboard transom garage door (see left side Fig. 5.4). The fuel tank vent serves as a pressure / vacuum release and safety overflow. The vent incorporates a flame arrestor, thus it is imperative that you keep the screens clear and in excellent repair. Replace the screens immediately if they become damaged or displaced. Periodically check the vent for clogging.



Figure 5.4

The deck fill and vent hose, fittings, and connections should be inspected for leaks, signs of dry rot or swelling at least once a year. If any of these conditions are present, have an authorized service technician inspect the fuel system immediately. If a leak is found, turn off battery switches, disconnect shore power, and disable

any possible source of ignition. Contact your dealer or Customer Service immediately.

## 5.2 Fuel Supply Lines and Hoses

If any fuel fill or vent hose's are in need of replacement, ensure that only USCG Type A1 or A2 are used.

The engine has a fuel supply hose that runs from the pickup tube in the fuel tank to the water separator (commonly referred to as the fuel filter), then from the water separator to the engine. Also, the engine has a fuel return hose that runs from the engine back to the fuel tank. If your boat has the optional generator, the generator will have the same basic setup with supply and return hoses (Fig. 5.11).

The fuel supply lines or hoses, fitting, and connections should be inspected often for leaks, signs of wear, dry rot, chafing, or swelling. A good way to inspect the fuel hoses is to run your hand along the length of the hose and fittings. Leaks will be revealed as wet spots on your hand. If any evidence of hose deterioration is present, have a qualified technician replace all the hoses with USCG Type A1 or A2 hoses immediately!

### **⚠ DANGER ⚠**

**The use of any hose other than the USCG Type A1 or A2 could result in fuel leakage. Leaking fuel is a fire and explosion hazard. Personal injury or death could result.**

*NOTE: If a leak is found, turn off battery switches, disconnect shore power, and disable any source of ignition. Do not start your engines, the generator, or any devices that could create a spark. Contact your dealer or our Customer Service Department immediately! If hoses need to be replaced, make sure only USCG Type A1 or A2 are used.*

## 5.3 Fuel Valves

Your boat has fuel shutoff valves located at the tank in the supply line route (see engine fuel line lower right Fig. 5.4). These valves start or stop the flow of fuel through the supply lines.

*NOTE: Even if the fuel supply valves are closed, there may be fuel in the supply lines to the filter and engine (and optional*

## Fuel Systems

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*generator). Disconnecting these fittings without properly bleeding the system of fuel could result in emptying the fuel filter and causing a fuel spill. Only a qualified technician should ever make repairs to your fuel system.*

Turning the fuel line valve handle so it is perpendicular to the valve body shuts off the supply or return. Turning the handle so it is in line with the valve body opens the valve.

---

### 5.4 Fuel Filters (Water Separators)

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The fuel supplied to the engine (and optional generator) may contain impurities found in the fuel tank or from the fuel itself. If these impurities are not removed prior to starting the engine (or optional generator engine), performance may be seriously affected. Removal of the fuel impurities is accomplished by external fuel filters.

#### 5.4.1 Engine Filter

The engine has a separate filter located apart from the engine (the engine assembly has a secondary fuel filter) and is mounted on the port aft wall of the engine compartment. It can be accessed through the aft cabin engine access cover (Fig. 5.5).

An authorized service technician should replace the filter annually prior to spring launch. More frequent replacements may be required if engine performance is degraded due to contaminated fuel.



Figure 5.5

*NOTE: Please refer to the fuel filter manufacturer's OEM manual for further details regarding operation, care and maintenance.*

#### 5.4.2 Generator Filter

The optional generator also has a separate fuel filter apart from the generator unit (see Fig. 5.10). It is located just aft of the fuel tank (near the engine filter(s)) and can be accessed by the upper salon floor hatch.

#### 5.4.3 Fuel Filter Service

Refer to the fuel filter's OEM manual for details regarding the following:

1. Priming the unit
2. Servicing the unit
3. Filter replacement
4. Troubleshooting procedures
5. Replacement parts

*NOTE: Please refer to the fuel filter manufacturer's OEM manual for further details regarding operation, care and maintenance.*

---

### 5.5 Fueling Your Boat

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Before fueling, check the fuel system for leaks. Check components for weakening, swelling, or corrosion. Immediately replace any leaking or defective components before operating an engine. Keep the tank as full as practical to reduce condensation and the accumulation of moisture in the fuel system. However, consider fuel expansion during warm and hot weather and fill accordingly. A fuel tank may overflow if its fuel expands beyond its capacity. Fuel expansion may occur in situations involving warmer environments where fuel is pumped from cool underground storage tanks or when air temperatures are cooler (night and early morning).

Follow these procedures to fuel your boat:

1. Safely and securely moor your boat to the dock.
2. Turn off engine.
3. Turn main battery switches off to prevent sparks from

## Fuel Systems

electrical equipment (lights, blowers, pumps, etc.) (see DC Electric System chapter in this manual).

4. Disconnect shore power if connected (see AC Electric System chapter in this manual).
5. Put out all cigarettes, cigars, pipes, or other items that may produce a spark or flame.
6. Close all hatches, doors and compartments.
7. Ask guests to leave the boat during fueling.
8. Remove cap from the deck fill pipe.
9. Insert the fuel hose nozzle into the fill pipe. During fueling, maintain contact between the nozzle and the fill pipe.
10. After pumping several gallons of fuel, inspect engine compartment for any signs of fuel leakage.
11. Fill the tank, allowing space at the top of the tank for thermal expansion.
12. Fill slowly near the top to avoid overflow.
13. Remove nozzle after tank is full and replace fill cap. Make sure cap is tight.
14. After fueling is complete, open all hatches, doors, and compartments.
15. Visually check all fuel fittings, lines, and tanks for fuel leakage.
16. Check all lines up to the engine. Smell for fumes.
17. Correct any problem before you start the engine.
18. Turn main battery switches on (see DC Electric System chapter in this manual).
19. Restart engine and restore boat to operating condition (see Getting Underway chapter in this manual).

**IMPORTANT:** *Do not smoke until your boat is clear of the fuel dock.*

### **⚠ DANGER ⚠**

**Fuel vapors can explode. Do not smoke at the dock. Extinguish all flames, stove, and other ignition sources before you approach a fuel dock.**

### **⚠ DANGER ⚠**

**Explosive fuel vapors can become trapped in the lower portions of the boat. Close all hatch covers, windows, doors, and compartments while fueling your boat.**

## 5.6 LPG (Liquefied Petroleum Gas) System

LPG (Liquefied Petroleum Gas) is a generic term to describe liquefied gasses consisting predominately of Propane (C3) and Butane (C4) hydrocarbons.

Your boat comes equipped with one 4lb LPG tank. LPG is used to fuel your galley stove (see Fig. 5.11 for the LPG system layout). The tank is located in the specially designed and fully contained LPG locker located in the aft starboard cockpit seat locker (see Fig. 5.6). For convenience, the locker has additional space for a second LPG tank.

Within the LPG locker is the tank hose connection and regulator/solenoid. The hose connection should be threaded snugly onto the tank. When two tanks are present, switch the hose connection between them as needed.

A remote panel (Fig. 5.7) is located at the galley and mounted on the lower forward upper galley cabinet face. This remote panel allows automatic control over the flow of LPG to the stove. Please refer to the DC Electric Systems chapter in this manual for details on powering the remote panel.





## Fuel Systems

Figure. 5.6



Figure. 5.7

### 5.6.1 Hazard Awareness

1. LPG is extremely flammable! These gasses readily form explosive air-vapor mixtures at ambient temperature. These vapors are heavier than air and may travel to sources of ignition (e.g. along drainage systems, into bilges, etc.).
2. Liquid from the tanks will generate large volumes of flammable vapor (approximately 250:1).
3. Cold burns (frostbite) will result from skin/eye contact with liquid from the tanks.
4. Liquid release or vapor pressure jets present a risk of serious damage to the eyes.
5. Willful abuse involving inhalation of very high concentrations of vapor, even for short periods, can produce unconsciousness and possibly death. Inhalation may cause irritation to the nose and throat, headache, nausea, vomiting, dizziness, and drowsiness.
6. Unconsciousness or asphyxiation may result in poorly ventilated or confined spaces.

### 5.6.2 Leak Testing

Conduct the following test on your LPG system to check for leaks each time the cylinder supply valve is opened for stove use:

1. Close all range burner valves by turning the controls to the OFF position.

2. Open the manual cylinder and solenoid valve (via the remote switch) and make a note of the reading on the pressure gauge.
3. Close the manual cylinder valve.
4. Check the pressure gauge. It should remain constant for at least 10 minutes. If it does not, gas is leaking out of the system.

If the LPG system has a leak, consult the OEM manual for directions on leak detection and component replacement.

### 5.6.3 Basic LPG Panel/Stove Operation

1. Power up the remote panel (Please refer to the DC Electric Systems chapter in this manual for details on powering the remote panel).
2. Press the "ON" button on the LPG remote panel.
3. Push in the control knob of the desired burner and turn counter-clockwise 90 degrees.
4. While pushing in the control knob, push the ignition button located on the left side of the control knob.
5. Once lit, continue pushing the knob in for 20 seconds to heat up the proper components.
6. Adjust the knob to the desired level of flame.
7. Turn off the burner by turning the control knob clockwise to the off position.

*NOTE: Please refer to the stove top/oven manufacturer's OEM manual for further details regarding operation, care and maintenance.*

### 5.6.3 When Not In Use

Practice the following safety measures when the LPG system is not in use:

1. All valves (tanks and solenoids) must be closed when the boat is unattended.
2. All valves must be closed immediately in any emergency.
3. All valves are recommended to be closed while the stove is not in operation.

Please refer to the DC Electric chapter in this manual for details on power supply and basic start-up procedure.

## Fuel Systems

### 5.6.4 First-Aid Measures

**Eyes:** Immediately flush eyes with plenty of cool water for at least 15 minutes. Hold eyelids apart while flushing to rinse entire surface of eye and lids with water. Seek immediate medical attention.

**Skin:** In case of cold burns, immediately place affected area in warm water (104-107 F, 40-42 C) and keep immersed until circulation returns. Seek immediate medical attention.

**Other requirements:** Severe inhalation or overexposure to this material may sensitize the heart to cat echo la mine-induced arrhythmia. Do not administer cat echo la mine\* to overexposed individuals. Contact the Poisons Information Service and/or seek further medical advice.

\*(Cat echo la mine are chemical compounds derived from the amino and tyrosine that act as hormones or neurotransmitters. "Wikipedia Encyclopedia")

### 5.6.5 Fire-Fighting Measures

1. Activate emergency systems and/or sound the alarm. Call the Fire Department. Evacuate all persons from the area.
2. Ensure an escape route is always available from any fire. If it is safe to do so, close the container valves. If unable to cut off supply of gas, allow it to burn. Allow any gas-fueled fire to burn out.
3. Keep LPG cylinders or tanks cool, as pressurized containers will explode if subjected to high temperatures.
4. Small LPG fires can be attacked with dry powder fire extinguishers, provided the fuel supply can be turned off after the fire is extinguished.

### 5.6.6 Accidental Release Measures

As these substances have a very low flash point, any spillage or leak is a severe fire and/or explosion hazard. Take the following measures in the event of a leak:

1. If a leak has not ignited, stop gas flow at container, eliminate all sources of ignition, and evacuate all persons. Stay upwind of release. Inform emergency services.

2. Liquid leaks generate large volumes of flammable vapor, heavier than air, which may travel to sources of ignition (e.g. along drainage systems).
3. Where appropriate, use water spray to disperse the gas or vapor.
4. Vapor may collect in any confined space.
5. If spillage has occurred in a confined space, ensure adequate ventilation and check that a safe, breathable atmosphere is present before entry.
6. Do not enter a vapor cloud. Only trained specialized individuals should attempt to enter a vapor cloud.
7. Wear protective clothing (see section on Exposure Controls / Personal Protection).

Small quantities of spilled liquid may be allowed to evaporate. Vapor should be dispersed by effective ventilation.

In the event of a major leak, contact the appropriate authorities.

### 5.6.7 Handling and Storage

1. Store and use only in equipment/containers for use with your particular appliance. Tanks should only be stored in a locker installed and designed for LPG storage, outside the living areas of the boat.
2. Installation of added appliances should only be performed by qualified personnel.
3. Follow manufacturer's instructions for changing tanks.
4. Ensure good ventilation.
5. Avoid inhalation of vapor.
6. When handling cylinders, wear protective footwear and suitable gloves.
7. When handling cylinders (above head height) protective headgear may be necessary.
8. When changing tanks, wear suitable gloves and safety goggles or face shields.
9. Avoid contact with the eyes.

## 5.6.8 Exposure Controls / Personal Protection

Figure 5.9

**Skin Protection** – Wear suitable protective overalls with long sleeves to cover exposed skin.

**Eye Protection** – Use chemical goggles or face shield when changing tanks.

**Hand Protection** – Use impervious gloves when changing tanks; use suitable protective gloves when handling cylinders.

**Foot Protection** – Wear safety boots or shoes when handling cylinders.

**Head Protection** – When handling cylinders above head height, protective headgear may be necessary.

## 5.6.9 Stability and Reactivity

Stable at ambient temperatures.

Hazardous polymerization reactions will not occur.

## 5.6.10 Material to Avoid

Avoid contact with strong oxidizing agents.

## 5.6.11 Hazardous Decomposition Products

Normally Carbon Dioxide (CO<sub>2</sub>). Incomplete combustion will generate Carbon Monoxide (CO). See the Boating Safety Chapter for more information on Carbon Monoxide.

*NOTE: High concentrations of CO may be explosive.*

## 5.6.12 Toxicological Information

**Eyes:** Will present a risk of serious damage to the eyes if contact with liquid or vapor pressure jet occurs.

**Skin:** Will cause cold burns (frostbite) if skin contact with liquid occurs.

### Exposure Limits

	Long Term Exposure Limit (PPM) (8 hr TWA)
Butane	800
LPG	1000
(source: CDC)	

**Inhalation:** Low vapor concentrations may cause nausea, dizziness, headaches, and drowsiness. High vapor concentrations may produce symptoms of oxygen deficiency which, coupled with central nervous system depression, may lead to rapid loss of consciousness.

**Abuse:** Under normal conditions of use, the product is not hazardous. Abuse involving deliberate inhalation of very high concentrations of vapor, even for short periods, can produce unconsciousness and/or result in sudden death.

## 5.6.13 Environmental Information

Spills are unlikely to penetrate the soil. It is also unlikely to cause long term adverse effects to the environment and will photo-degrade under atmospheric conditions.

Spills are unlikely to cause long term effects in the aquatic environment.

## 5.6.14 Disposal Considerations

Product discharge may only be carried out by qualified persons.

- Do not dispose of any LPG container.
- Return all cylinders to the supplier.

**⚠ DANGER ⚠**

**Open flame cooking appliances consume oxygen.  
This can cause asphyxiation or death.**

**Maintain open ventilation.**

**Liquid fuel may ignite, causing severe burns.**

**Use fuel appropriate for the type of stove installed.**

**Turn off stove before changing tank.**

**Do not use for comfort heating.**

**Use special care for flames near urethane foam.  
Once ignited, it burns rapidly, producing extreme heat and releasing hazardous gasses and consum-**

## Fuel Systems

Troubleshooting		
Problem	Cause	Solution
Fuel overflows at the fill plate (tank not full)	Fill or vent line blocked	Check lines. Clear obstruction from line or straighten line if kinked.
Water or moisture in fuel tank	Cap on deck fuel fill plate not tight	Check cap. Tighten.
	Condensation forming on walls of partially filled tank.  Poor quality fuel from marina tanks.	See next item above. If problem remains, fuel tank and lines may need to be drained and flushed. See your dealer for service.  Check fuel/water separators. Drain if necessary. Check with your dealer.
Engine cranks but will not start (fuel system)	Lack of fuel.	Clean fuel filter, check fuel level. Check whether anti-siphon valve, if so equipped, is stuck shut. Improper starting procedure. Review starting procedures in engine manual.
	Clogged fuel filter.	Check and replace fuel filter. Check fuel pump, fuel pump filter and fuel tank line for cracked flanges or restricted fittings.



## **FUEL SAFETY CHECKLIST FOR BOARDING**

**This fuel safety checklist is designed to be used as a quick reference to minimize the risks associated with fuel hazards. You should refer to this checklist every time you board your boat. Read your Operator's Manual so that you have a full understanding of the fuel system on your boat.**

- » Before approaching your boat, extinguish all smoking materials and make certain there are no other sources of possible ignition near your boat.
- » Approach your boat alone to make the initial inspection. Have your guests and crew standby a safe distance away.
- » From the dock, visually inspect your boat for any fuel leaks from the deck fills or hull vents and take notice if there is any odor of fuel.
- » Once aboard, open the cabin door and sniff at the doorway then inside the cabin for fuel odor.
- » Open the machinery compartment hatches and sniff for fuel odor.
- » Inspect the machinery compartments for fuel leaks and sniff for fuel odor.
- » If there are any signs of fuel leakage, either visually or by odor, open doors, hatches, and windows. Evacuate the boat and inform the dock master. Have an authorized service technician inspect your boat.
- » If no signs of fuel are present, board your guests and crew.
- » Run exhaust blower for five minutes before starting the engines or generator.
- » Always be aware of the hazards associated with fuel and practice good common sense.

**"HAPPY AND SAFE BOATING" from the Marlow-Hunter Team**

## FUEL SYSTEM LAYOUT (WITH OPTIONAL GENERATOR)

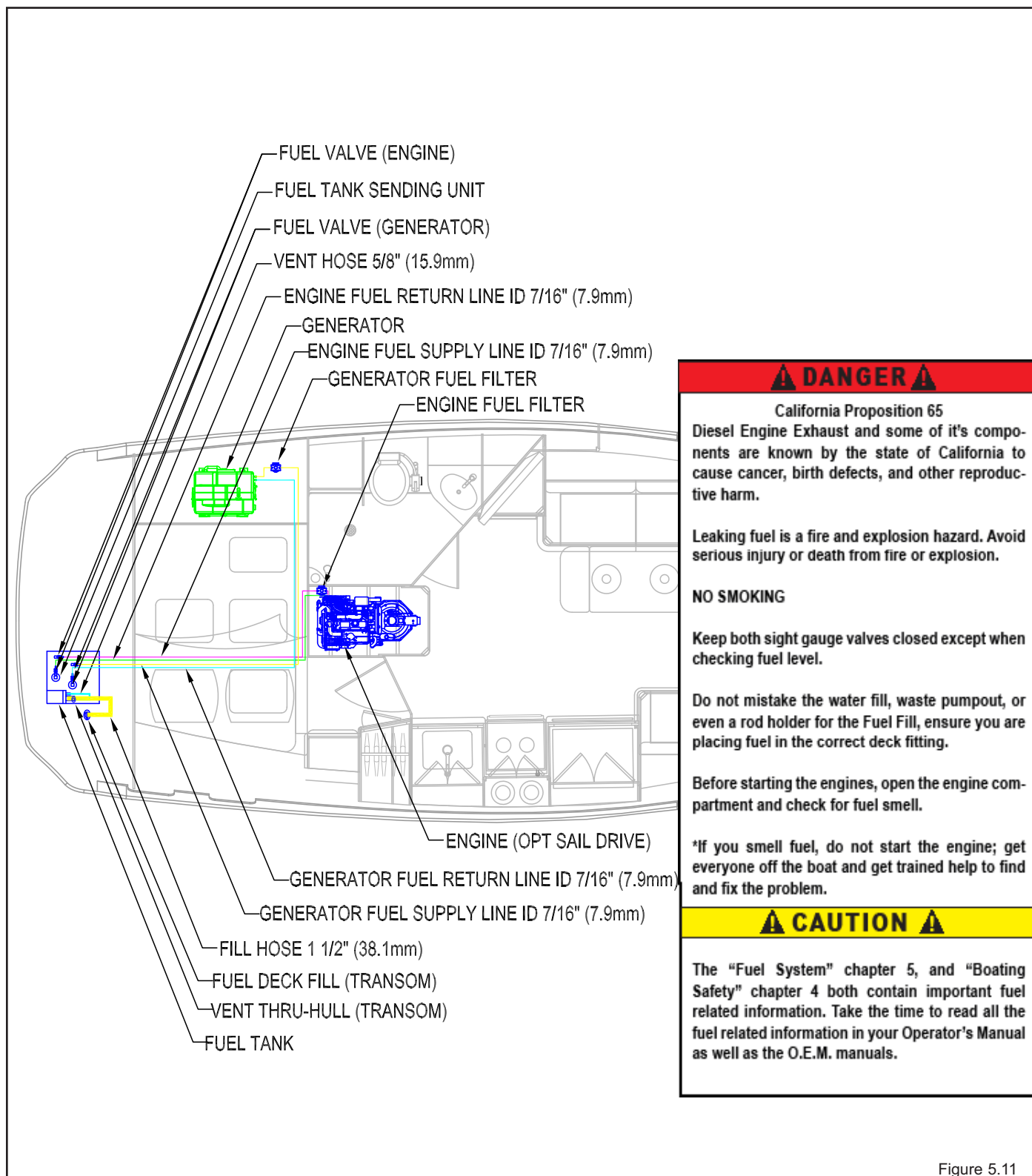


Figure 5.11

## LPG SYSTEM LAYOUT

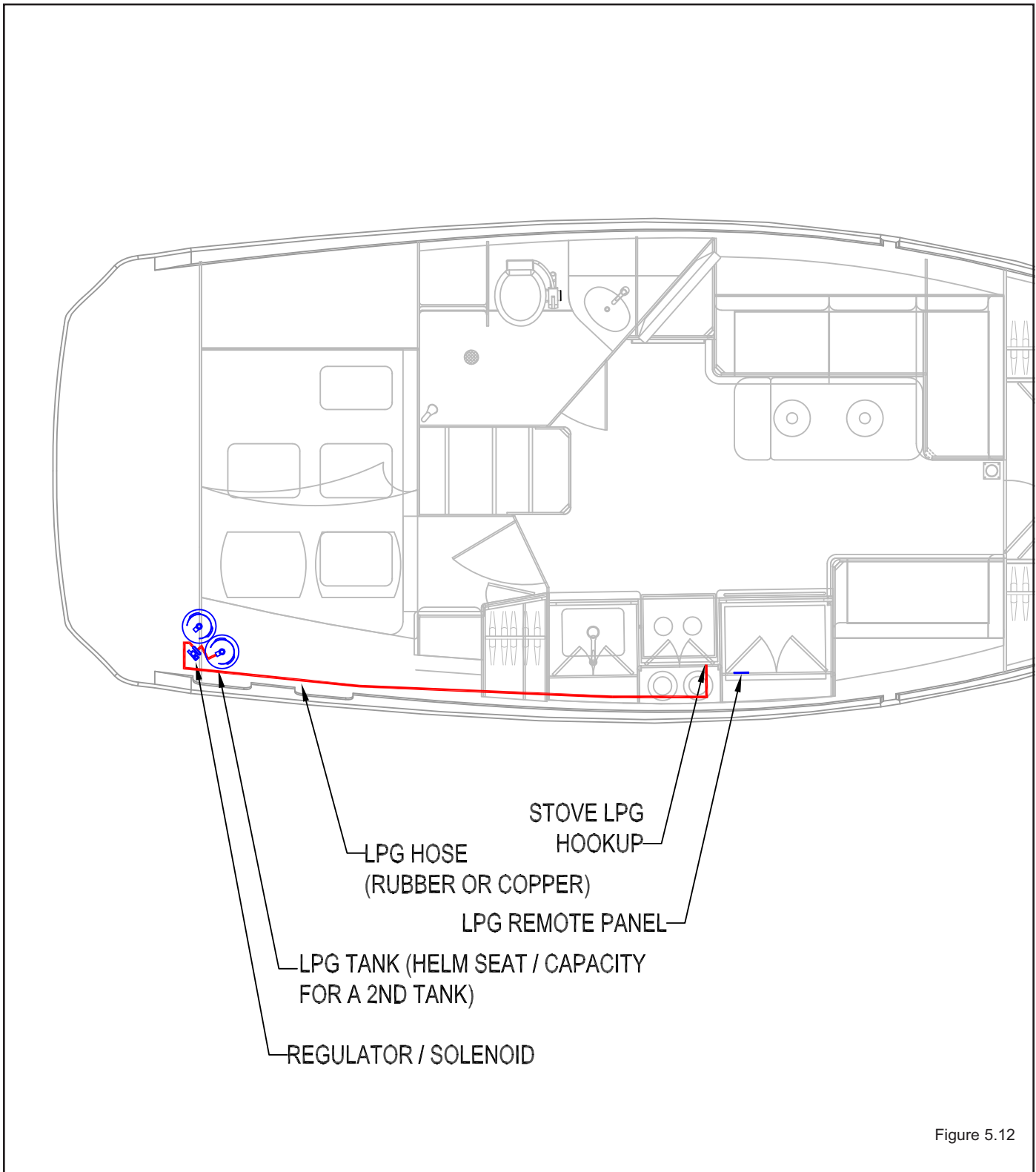


Figure 5.12

## Fuel Systems

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MARLOW-HUNTER, LLC

*Chapter 6*

# *Underwater Gear*

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*MH31*



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## Underwater Gear

This section will detail those components which are submerged or generally under water. We will organize these components into the following categories:

1. Mechanical propulsion components
2. Steering components
3. Intakes and discharge skin fittings
4. Monitoring equipment
5. Anchoring and Windlass (optional)
6. Keel

### 6.1 Mechanical Propulsion Components



**Keep clear of moving parts at all times. Protect moving parts from impact during normal use.**

Propulsion components are those involved in the movement of your boat.

#### 6.1.1 Propeller

The propeller supplied with your boat (e.g. Fig. 6.1 - sail-drive option) has been selected as the best propeller for average use. Propellers use “pitch” as part of its specifications and determines the amount of power exerted from your engine. Pitch is the displacement resulting from a 360 degree revolution of the propeller. A 16” pitch means a 16” advancement from a complete spin of the propeller. Do not change the pitch of your propellers without getting your dealer’s recommendations first. If you change to a different propeller pitch, do NOT use a propeller which allows the engine to operate at a higher than recommended RPM. Your engine OEM manual will specify the maximum recommended RPM.

To maintain rated power, propellers should be free of nicks, excessive pitting and any distortions that alter them from their original design. Badly damaged propellers should be replaced, but those that are chipped, bent or merely out of shape can be reconditioned by your marine dealer.

Consider keeping an extra propeller on your boat (see Fig. 6.2 for propeller specs). If the installed propeller becomes damaged, it can be replaced with the spare without major disruption to your outing. We recommend the replacement procedure be performed by competent

professionals.



Figure 6.1

CONFIGURATION	BLADES	DIAMETER	PITCH	DIR
21 HP	2	16"	11"	RH
29 HP	2	16"	13"	LH
29 HP	2-FOLD	16"	12"	LH

Figure 6.2

#### 6.1.2 Shaft Drive

The 21HP engine (see the Engines and Transmissions chapter of this manual for additional details about the engine) utilizes the standard shaft method of propulsion. The shaft is made of 1” diameter Aquamet 19 or equivalent stainless steel which has excellent corrosion resistance and very high strength. The coupling at one end of the shaft is bolted to the transmission. The other end of the shaft is tapered, threaded, and keyed for installation of the propeller.

The propeller shaft passes through the hull via a shaft seal followed by a strut mounted to the underside of the hull which holds and stabilizes the propeller shaft in position. Refer to Fig 6.3 for details of the shaft, shaft seal strut and propeller assembly.

##### 6.1.2.1 Shaft Alignment

Aligning the engine with the propeller shaft is critical for smooth operation of your boat. Your dealer should check alignment as part of commissioning. However, shaft alignment may shift slightly after your boat is in use and may need to be realigned, particularly if there is vibration, drumming sound, or loss of RPM's. See Fig. 6.4 for an

## Underwater Gear

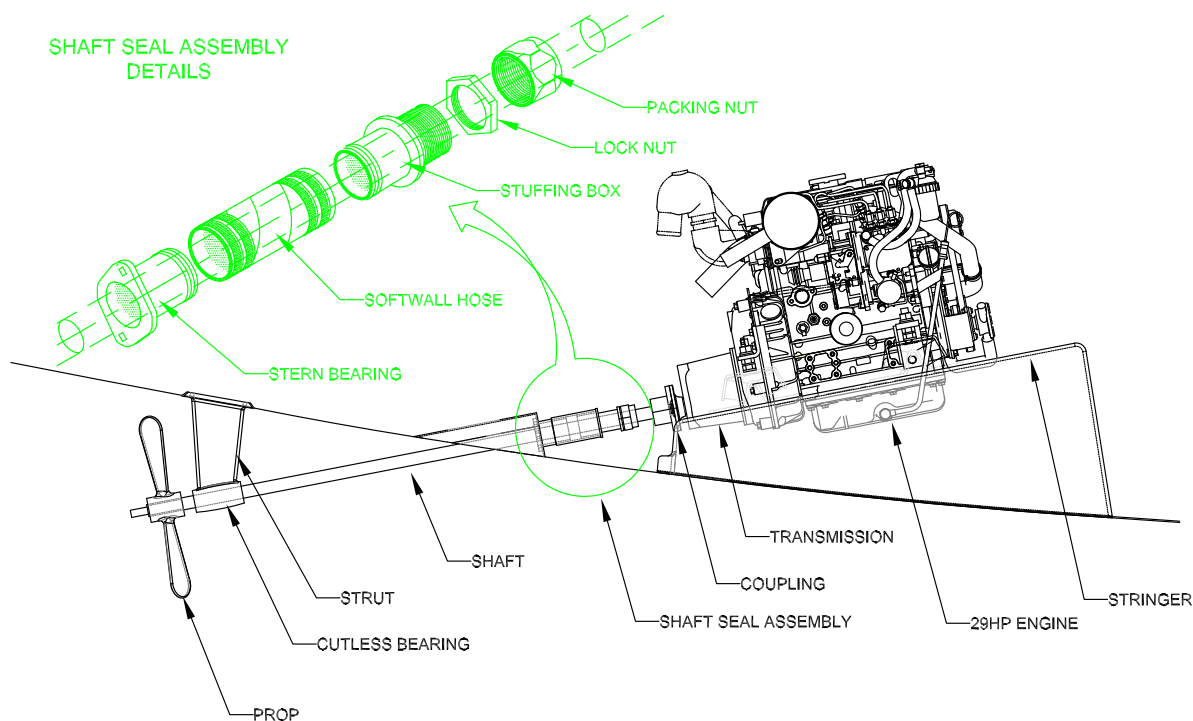


Figure 6.3

illustration of the alignment steps. We recommend the alignment procedure be performed by competent professionals.

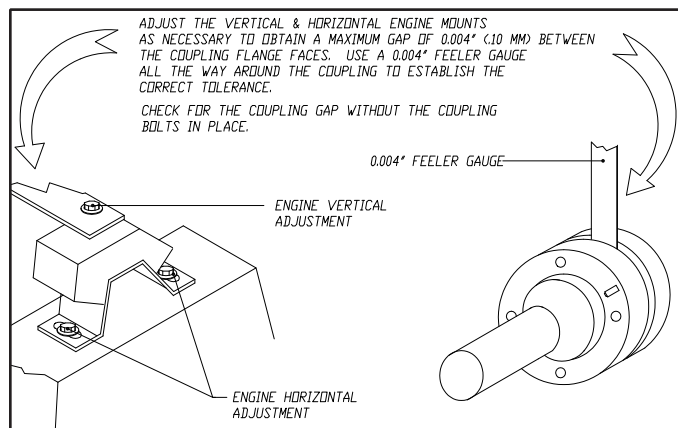


Figure 6.4

### 6.1.2.2 Cutless Bearing

The propeller shaft is supported by the strut. The strut houses a replaceable bearing (Fig. 6.3) to minimize wear and to protect the shaft at the point where it passes through and contacts the strut. The bearing should be

inspected annually and replaced as necessary. We recommend the replacement procedure be performed by competent professionals.

### 6.1.2.3 Shaft Seal Assembly

The shaft seal assembly consists of the stern bearing, hose, stuffing box, lock nut and packing nut (Fig. 6.3). This assembly acts as the union between water and hull, allowing the propeller shaft to extend from the hull and rotate without a water breach. The stuffing box incorporates a replaceable packing system which is calibrated to allow a specific number of drips per minute. This water provides the proper environment to control the frictional impact between the rotating shaft and packing material. Your stuffing box should produce 1 to 2 drips per minute. Inspect your shaft seal assembly annually.

### 6.1.3 Sail Drive

The 29HP engine (see the Engines and Transmissions chapter of this manual for additional details about the engine) utilizes the saildrive method of propulsion. For reference purposes, Fig. 6.5 illustrates the sail drive leg and gear assembly and Fig. 6.6 illustrates the full sail drive/engine assembly.



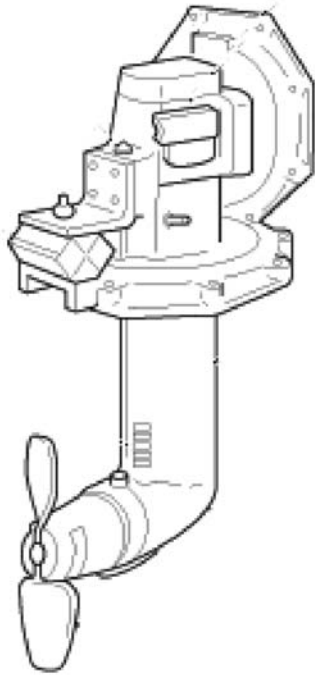


Figure 6.5

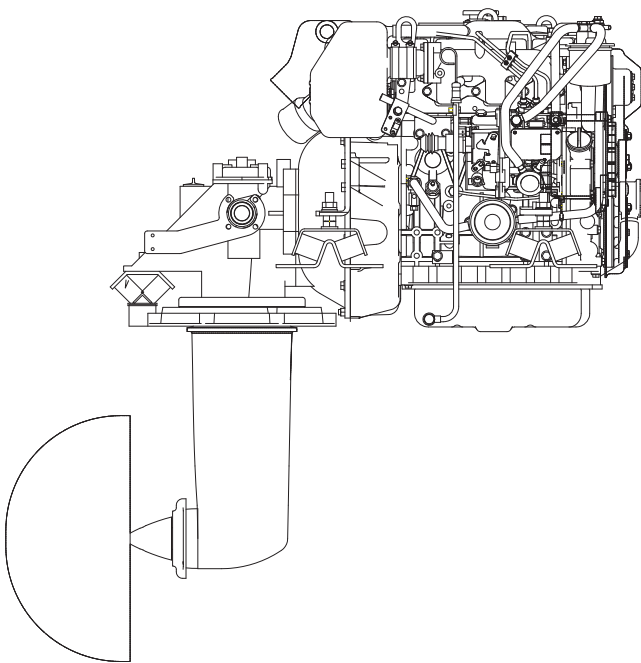


Figure 6.6

The saildrive has some advantages over the traditional shaft drive. It is quieter with less vibration and it offers higher efficiency due to the foil shaped sections of the drive leg and lack of any shaft angle.

It is extremely important to regularly check the sacrificial zinc anode attached to your saildrive. The anode

provides protection against galvanic corrosion. Refer to the manufacturer's OEM manual for a complete listing of regular maintenance items and schedules for your saildrive.

## 6.2 Steering Components

### **⚠ DANGER ⚠**

**Keep clear of moving steering parts at all times. Protect moving parts from impact during normal use.**

### 6.2.1 Steering System

The steering system of your boat consists of a steering wheel, canting pedestal, linkage, gearbox/output lever, drag-link, tiller arm and rudder assembly (Fig. 6.7). Movement of the steering wheel is reflected in the spin of the lower spindle. The spindle is linked to the gearbox which rotates the output lever. The movement of the output lever is transferred to the tiller arm by connection through the draglink. This assembly concludes with the rudder post bolted to the tiller arm. Thus, movement of the steering wheel translates to the rotation or swing of the rudder.

If the optional autopilot is installed, a wheel pilot will provide the automatic steering.

*NOTE: Please refer to the steering OEM manual for specific details and maintenance specifications.*

### 6.2.2 Rudders

The rudder blade (see Fig. 6.8) is fabricated with a stainless steel internal grid structure surrounded by foam and fiberglass. The rudder bearings are self lubricating. Inspect your rudder for free and smooth movement between rudder stock and bearings.

Obviously, your steering system is a critical component aboard your boat. However, all boat operator's should be prepared for steering failure or loss. If the situation arises where the rudder assembly is not functioning properly and affecting your steering, your boat comes equipped with an emergency tiller to provide the required maneuverability.

## Underwater Gear



Figure 6.7

If your standard steering is experiencing a problem, inspect the rudder's upper bearing, lower bearing and drag links for damage or obstruction. If the situation can not be remedied, proceed with the following steps to assemble the emergency tiller for low-speed steering:

1. Idle the boat.
2. Remove the emergency tiller handle from its storage location within the port lazarette seat hatch (see Fig. 6.9).
3. Locate and open the access cover for the rudder shaft located in the steering assembly cover (often referred to as the quad cover) (see Fig. 6.10).
4. Insert the notched end of the tiller handle on top of tiller base pin.

You are now able to manually steer your boat. Proceed to the closest location for standard steering system review and repairs.

### ⚠ CAUTION ⚠

**Because the backup steering system can also be lost, an operator must be able to cruise without a rudder or otherwise be prepared to assemble a makeshift rudder.**

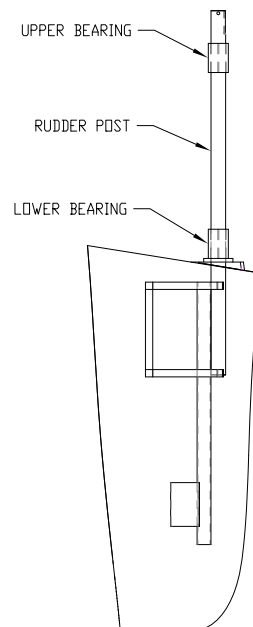


Figure 6.8



Figure 6.9

## 6.3 Intakes and Discharges

### 6.3.1 Below the Waterline

On the bottom of your boat, you will find skin fittings for the intakes and discharges for the supply and release of your boat's various systems (i.e. seawater for the air conditioner, waste from the waste tank, etc.). Care should be taken that these skin fittings are clear and open and should be cleaned of barnacles and other growth as specified in the maintenance section of this manual.

## Underwater Gear



Figure 6.10

Refer to Figures 6.17 for skin fitting locations. Later chapters in this manual will go into further detail about the various systems that will incorporate these intakes and discharges.

### 6.3.2 Above the Waterline

As evidenced by the category, these skin fittings are generally above the waterline but may be below the water when sailing or in heavy seas. These fittings are associated with the discharge of water collections or the venting of tanks.

Refer to Figures 6.18 and 6.19 for thru-hull locations. Later chapters in this manual will go into further detail about the various systems that will incorporate these fittings.

## 6.4 Monitoring Equipment

The optional electronics package installed on your boat will vary boat to boat. If your electronics include knott or depth capabilities, a transducer (Fig. 6.11) will be installed below the waterline. In general, a transducer is the sensing device which provides necessary information to your electronic equipment, such as depth, speed, temp, wind, etc. Refer to the electronics OEM manuals for specific details about your equipment. This trans-

ducer is located within the v-berth and accessed through the floor panel.



Figure 6.11

## 6.5 Anchoring and Optional Windlass

A complete anchoring assembly includes the anchor, bow roller, rode/chain, windlass, anchor locker and padeye.

### 6.5.1 Anchor

The anchor option available on your boat includes a 22 lb. delta anchor (see example Fig. 6.12) with a 150 foot rode and 15 foot chain. This anchor was selected based on your boat's size and weight under normal anchoring conditions. This style is effective with a variety of sea beds and remains stable under a variety of tide and wind conditions.



Figure 6.12

### ⚠ WARNING ⚠

Anchoring in unusual water and/or weather conditions will require additional precautions. Consult an approved guide for suggestions.

### 6.5.2 Windlass

## Underwater Gear

The optional windlass (see Fig. 6.13) facilitates the anchoring of your boat by automatically raising and lowering the anchor. To operate the windlass, the Anchor breaker switch, located on or near the Battery Switch Panel, must be set (refer to the DC Electrical Systems chapter of this manual).

### 6.5.2.1 Lowering the Anchor

1. Ensure the windlass breaker is ON (see DC System chapter in this manual).
2. Lift the protective cap from the windlass foot switch located on the bow near the anchorwell and depress the down switch (Fig. 6.14).

*Note: "Bump" the switch until the anchor clears the anchor roller and hull before letting anchor down freely or it may rock back and forth and strike the hull.*



Figure 6.13

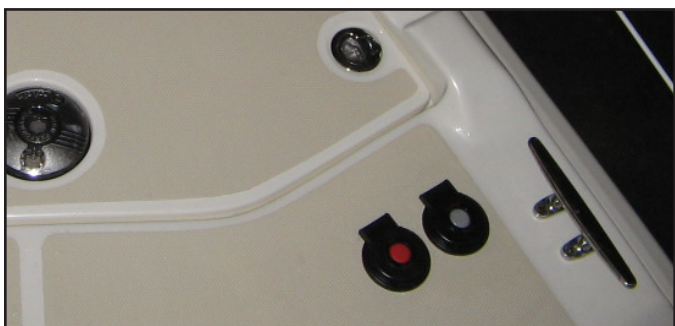


Figure 6.14

### 6.5.2.2 Raising the Anchor

1. Ensure the windlass breaker is ON (see DC System chapter in this manual).
2. Start the boat engines (reduces battery load and provides boat control when anchor is freed)
3. Lift the protective cap from the windlass foot switch located on the bow near the anchorwell and depress the up switch (Fig. 6.14). Be careful as the anchor approaches the hull and anchor roller. Continue until the anchor properly rests in the anchor roller.

### 6.5.2.3 Manual Windlass Operation

In the event the windlass is not functioning normally under power, one can manually lower or raise the anchor. A winch lever is included with the windlass for manual anchor deployment and maintenance of your windlass. Please refer to OEM manual for details on manual use and maintenance instructions and schedules.

*NOTE: It is important that the windlass clutch is tight for proper operation and safety. Periodically check the clutch and tighten if necessary.*

## 6.6 Keel

The keel (Fig. 6.15) provides a greater measure of lateral stability and generally simpler and more reliable handling of your boat. The keel design is based on the boat's weight and sail plan while minimizing draft. Hunter's standard keel is the shoal keel with available options of a deep keel or bilge keels.

The keel is fabricated with a configuration of large bolts and mounted to the hull's keel sump. Keel bolt nuts should be checked periodically to counter any thread slippage (Fig. 6.16) (see the Maintenance chapter in this manual for details on keel bolt specs). Removal, installation and nut adjustments of the keel should be performed by trained and competent professionals.





Figure 6.15



Figure 6.16

## Underwater Gear

Troubleshooting		
Problem	Possible Cause	Resolution
Excessive vibration	Material obstructing propeller	Remove material from propeller, shaft, or rudder by reversing engines. If necessary, stop engines and cut or pull material away.
	Bent prop or shaft	Replace propeller. If vibration continues, see your dealer for service.
	Excessive play in shaft seal	Check shaft seal for wear. Avoid sudden torque changes. See your dealer for repairs.
	Bent rudder	Replace. See your dealer for service.
Poor performance	Material wrapped around propeller	Run engines in reverse. If necessary, stop engines and cut or pull material away.
	Damaged propeller. Wrong propeller in use.	Replace propeller

## INTAKES/DISCHARGES BELOW WATERLINE

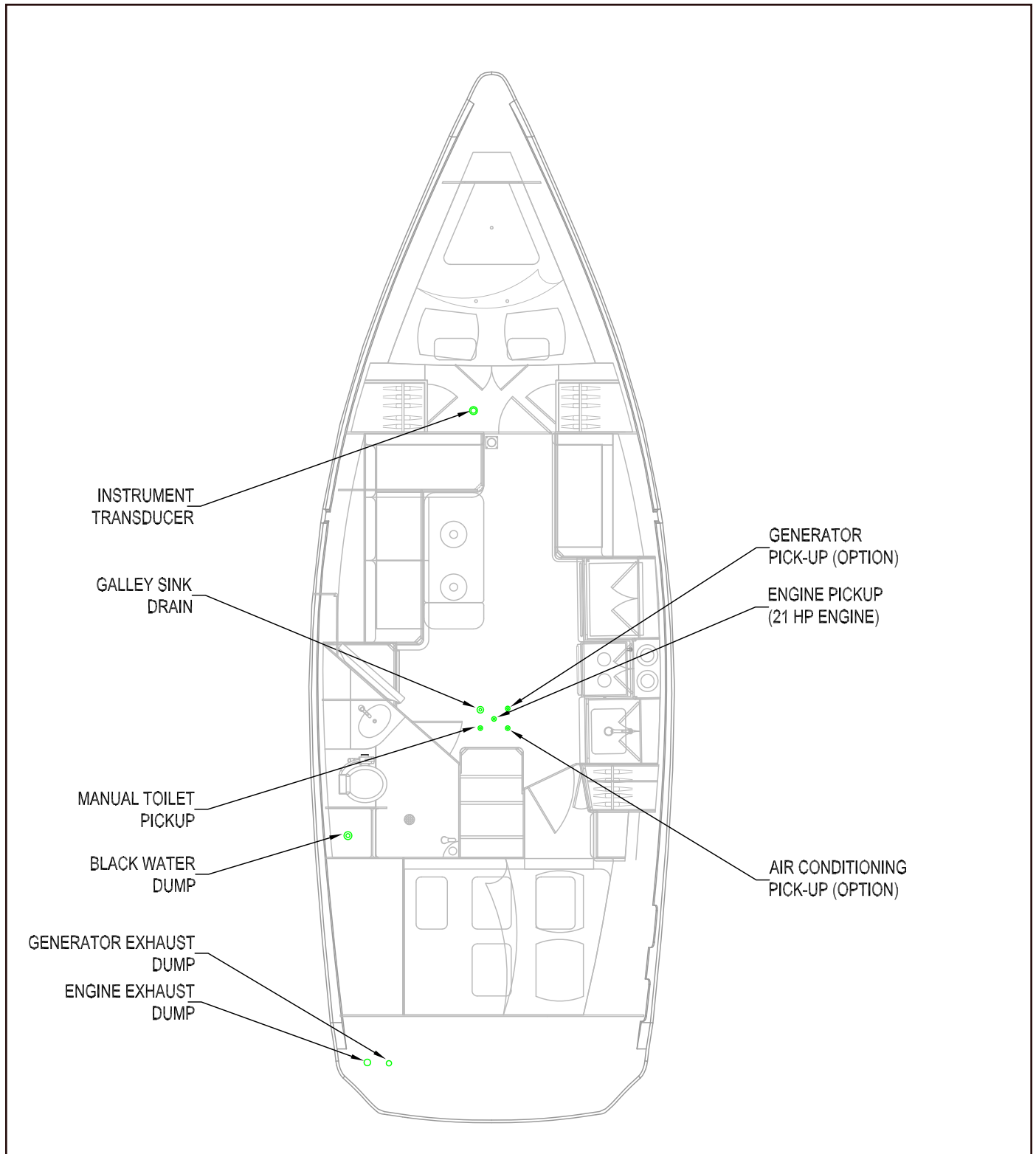


Figure 6.17

## THRU-HULLS ABOVE WATERLINE - STARBOARD SIDE

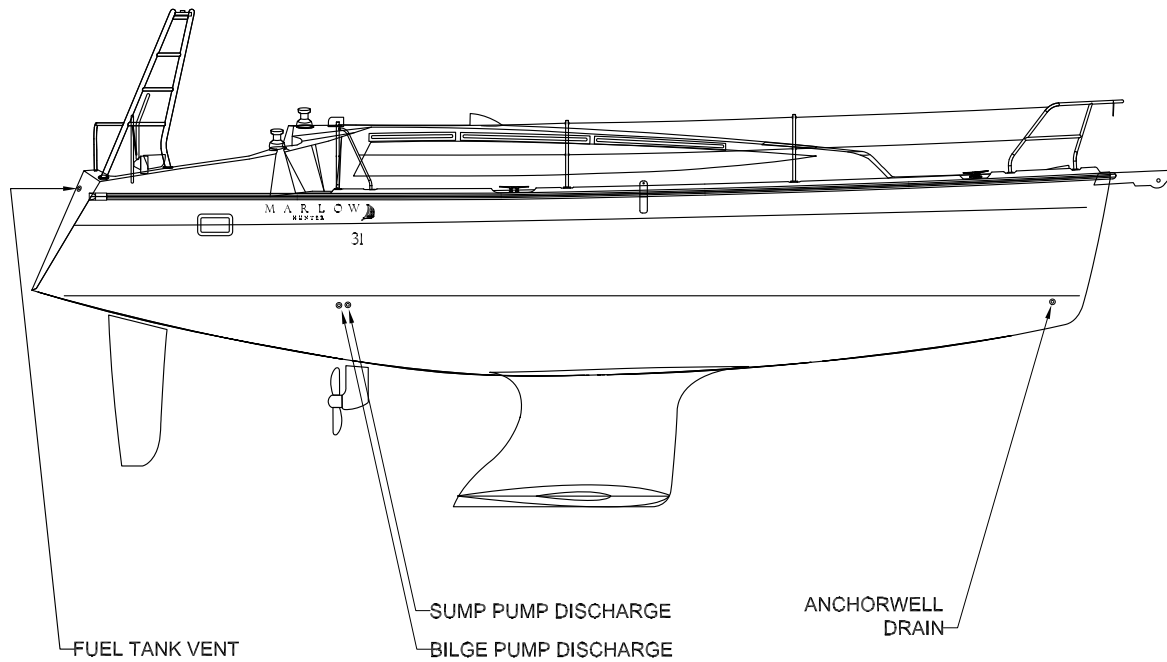


Figure 6.18

## THRU-HULLS ABOVE WATERLINE - PORT SIDE

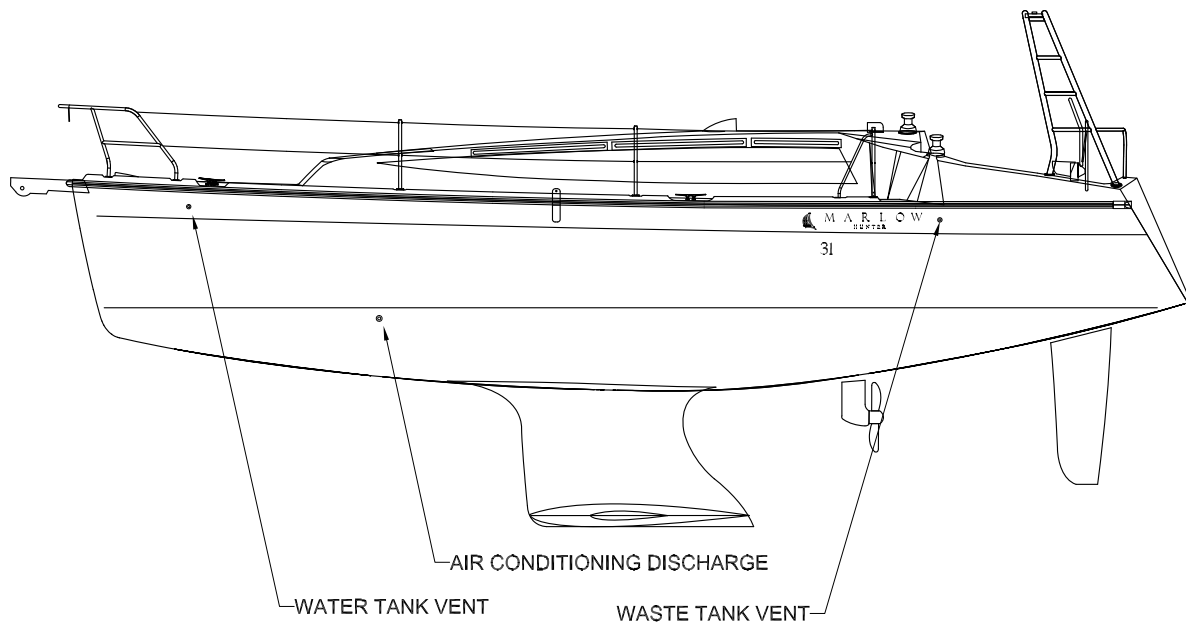


Figure 6.19



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MARLOW-HUNTER, LLC

*Chapter 7*

# ***DC Electric System***

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The purpose of this chapter is to provide information necessary to understand and operate the DC electrical system aboard your boat. This system comprises your boat's electrical components which are powered by battery. We will organize this section into the following topics:

1. DC Power System and Component Overview
2. DC Power Supply and Control Components
3. DC System Components and Operation
4. Other DC System Components
5. General Maintenance

The purpose of this chapter is not to educate on the repair or the expansion of the electrical systems. Nor is its purpose to educate on the basics of electricity. Again, the purpose is to provide you with the information to safely operate and maintain the DC electrical system.

## ⚠ WARNING ⚠

Electricity cannot be detected without the use of specialized test equipment. Never think you know whether a circuit is "live". Always have qualified, competent professionals inspect or make repairs to your electrical systems.

## ⚠ WARNING ⚠

Do not rely on the information in this manual as a repair guide. As always, only competent electrical service personnel should attempt to repair any electrical equipment or to expand the electrical system. Work performed by non-electrical service personnel may result in electrical shock or damage to the boats systems or components.

## 7.1 DC Power System and Component Overview

The source of power for the DC systems aboard your boat are battery banks. The control of that power is found in two individual master panels:

Name	Location
1. Battery Switch Panel (BSP)	Aft Cabin
2. DC Panel (DCP)	Galley

Additional panels can also be found on your boat but only remotely control individual components, i.e. engines, inverter, etc..

The individual systems controlled by these master panels will depend on the options chosen on your boat. Consequently, you may or may not have a switch/breaker as noted in this manual. The following table lists the systems, location and resettable breaker amperage for the possible components installed on your boat's master panels:

System	Panel	Breaker (AMP)
DC Main	BSP	50
Battery Charger (x2)	BSP	40
Bilge Pump (Main)	BSP	5
High Water Alarm / High Water Bilge Pump (Option)	BSP	10
CO Detectors	BSP	5
Running Lights	DCP	5
Anchor Light / Steaming Light	DCP	5
Cabin Lights	DCP	5
Water Pump	DCP	10
GPS / Chartplotter	DCP	10
Instruments / Autopilot	DCP	5
LPG Gas	DCP	5
Refrigerator or Freezer (x2)	DCP	15
Sump Pump	DCP	10
Head	DCP	25
TV/DVD	DCP	10
Stereo	DCP	10
12V Outlets	DCP	15
Tank Indicator	DCP	5
Blower	DCP	5

Figure 7.1

## 7.2 DC Power Supply and Control Components

Please refer to Fig. 7.19 for the basic power supply equipment and component layouts as reference for this

section.

### 7.2.1 Batteries

The batteries speced for your boat have been selected for their ability to furnish starting power based on engine requirements, as well as their ability to power the DC system components (or house). We recommend AGM (absorbed glass mat) batteries (see Fig. 7.2 for battery specs).



Size	Volts	Function	Qty
27	12	START	1
27	12	HOUSE	1

Figure. 7.2

The DC system derives its power from two separate battery banks, generally referenced as the “Start” and “House” batteries. Both batteries are located in the companionway and can be accessed by flipping up the hinged upper companionway step (Fig. 7.3).

Both banks are wired to the Battery Switch Panel, herein after referred to as the BSP (Fig. 7.4). The batteries supply power first to the battery selector switch on the BSP then to the 12 Volt DC Panel (Fig. 7.10), which distributes power to other subpanels and systems. (Some equipment is immediately energized from the batteries, i.e. main bilge pump.)

The negative terminal of both banks are attached to the DC ground connection on the engine. This system, known as the negative ground system, is the approved system for marine DC electrical systems. The battery wiring system has two color coded wires: yellow - negative (ground), and red - positive.

To avoid explosions, do not use jumper cables and a booster battery to start the engine. If batteries are dead, recharge them with the optional battery charger (if installed) (discussed later), optional inverter (if installed) (discussed later) or remove and recharge on shore.

Batteries produce hydrogen and oxygen gasses when being charged. If ventilation is poor, these explosive gasses escape through the vent/fill caps and may form an explosive atmosphere around the battery. This gas may remain around the battery for several hours after charging. Sparks or flame can ignite the gas and cause an explosion.



Figure. 7.3

### **⚠ DANGER ⚠**

**Batteries contain Sulfuric Acid and can cause severe personal injury if mishandled.**

**Avoid contact with eyes, skin, or clothing. In case of contact, flush with water at least 15 minutes.**

**If swallowed, drink large quantities of water or Milk of Magnesia, beaten egg, or vegetable oil and seek medical attention immediately.**

### **⚠ WARNING ⚠**

**Charging batteries produce gasses which can explode if ignited.**

**Explosion can shatter a battery.**

**Battery acid can cause severe personal injury such as blindness.**

**Keep flame, spark, and smoking materials away from batteries while charging. Charge in a well ventilated area.**

## BATTERY SWITCH PANEL (BSP)

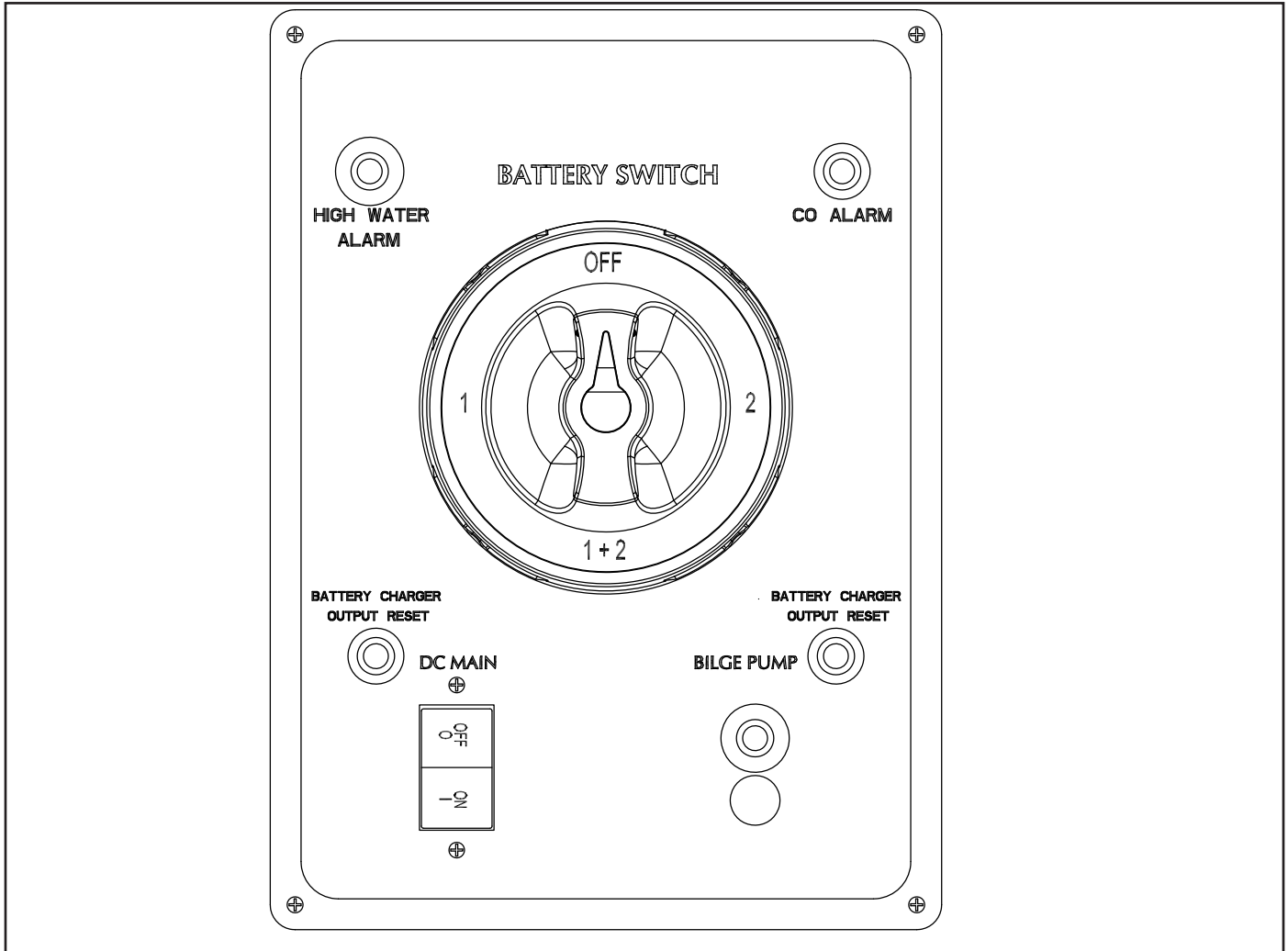


Figure 7.4

### **⚠ WARNING ⚠**

**Batteries contain a large amount of potential electrical energy!**

**Extreme care must taken when working with batteries.**

**An improper connection to a battery can release enough energy to cause severe personal injury or fire.**

To safely utilize the batteries stored energy, the following wiring precautions should be taken:

- The wiring to the batteries must have proper over current protection in the form of fuses or breakers.
- Use only battery chargers that have been listed by a testing agency, such as Underwriters Laboratories, Inc.
- Follow any wiring diagrams exactly.

To remove a battery, the following procedure should be followed:

1. Turn off all power drawing breakers and isolate battery.
2. Remove negative (-) cable first, then the positive (+).

## DC Electric Systems

To install a battery, the following procedure should be followed:

1. Attach the positive cable to the positive (+) terminal on the battery.
2. Attach the negative cable to the negative (-) terminal on the battery.

*NOTE: Batteries should always be removed and installed by trained, qualified persons to avoid potential damage.*

### 7.2.2 Battery Switch Panel (BSP)

The Battery Switch Panel (BSP) is located in the aft cabin and mounted on the inboard face of the engine compartment/companionway bulkhead. The battery banks are connected to the large switch labeled 'BATTERY SWITCH' (left panel Fig. 7.5).

The Battery Switch selector is a four position switch: "OFF" (12 o'clock), "1" (9 o'clock), "2" (3 o'clock) and "1+2" (6 o'clock).

Turning the selector switch to the "1" position provides power to the respective circuits from the Start Battery. Turning the selector switch to the "2" position provides power to the respective circuits from the House Battery. Turning the selector switch to "1+2" position provides power to the respective circuits from both the Start and House Batteries simultaneously. Consequently, power for both engine starting and house components can be sourced from a single battery or combined batteries.

The "DC Main" switch circuit breaker on the BSP provides power to the DC Panel (see Fig. 7.10) for the house components.

The BSP also houses the breakers for some components in your DC system requiring continuous power (i.e. bilge pump). The breaker controls are marked on the panel and they control systems or components on your boat that require an energized connection even through the DC Panel may be de-energized.



Figure 7.5

### 7.2.3 Battery Charger

Your boat is equipped with a battery charger (Fig. 7.6) to assist in maintaining charged batteries. It is located beside the batteries and accessed by flipping up the hinged upper companionway step (right side Fig. 7.3). A 40 amp pop-out breaker exists for each battery on the Battery Switch Panel labeled "BATTERY CHARGER OUTPUT RESET" and protects the DC electrical system circuitry from a power fault originating between the battery charger and the BSP. Similarly, a 15 amp toggle switch breaker labeled "BATTERY CHARGER" exists on the AC Panel which protects the AC electrical system circuitry from a power fault between the battery charger and the AC Panel (see AC Electric System chapter in this manual).

To charge the batteries, complete the following:

1. Connect the shore power cable (see left side Fig. 7.7 for standard cable / right side for optional Smartplug cable) to line 1 of the shore power inlets located within the transom garage (see Fig. 7.8).
2. Turn on the respective line's AC MAIN breaker on the AC Panel (see AC Electric System chapter in this manual).
3. Turn on the BATTERY CHARGER breaker on the AC Panel (see AC Electric System chapter in this manual).

*NOTE: Consult the charger manufacturer's OEM manual for*



*charger operation, care and maintenance.*



Figure 7.6



Figure 7.7



Figure 7.8

### 7.2.4 Engine Alternator

While your batteries can charge dock side through the battery charger or optional inverter (discussed later), they can also charge when under power through the engine alternator.

### 7.2.5 DC Panel

The DC Panel, herein after referred to as the DCP, is located on the aft galley bulkhead (Fig. 7.9). Please refer to Fig. 7.10 and note the systems and components controlled by the DCP.

### 7.2.6 Breakers, Switches and Fuses

All electrical systems aboard your boat are equipped with over-current protection in the form of breakers or fuses (Fig. 7.1 amperage table). All systems and components on the BSP and DCP are protected with breakers. Specific systems or components have been equipped with breaker switches for convenience in manually inter-action.



Figure 7.9

### 7.2.7 Inverter

An optional inverter is available to convert DC power to AC (see the AC Electric System chapter in this manual for further details). The assembly consists of the inverter (Fig. 7.11) and a remote panel (Fig. 7.12). The inverter is mounted to the right of the batteries and accessed by flipping up the hinged upper companionway step. The remote panel is located on the aft galley bulkhead

## DC Electric Systems

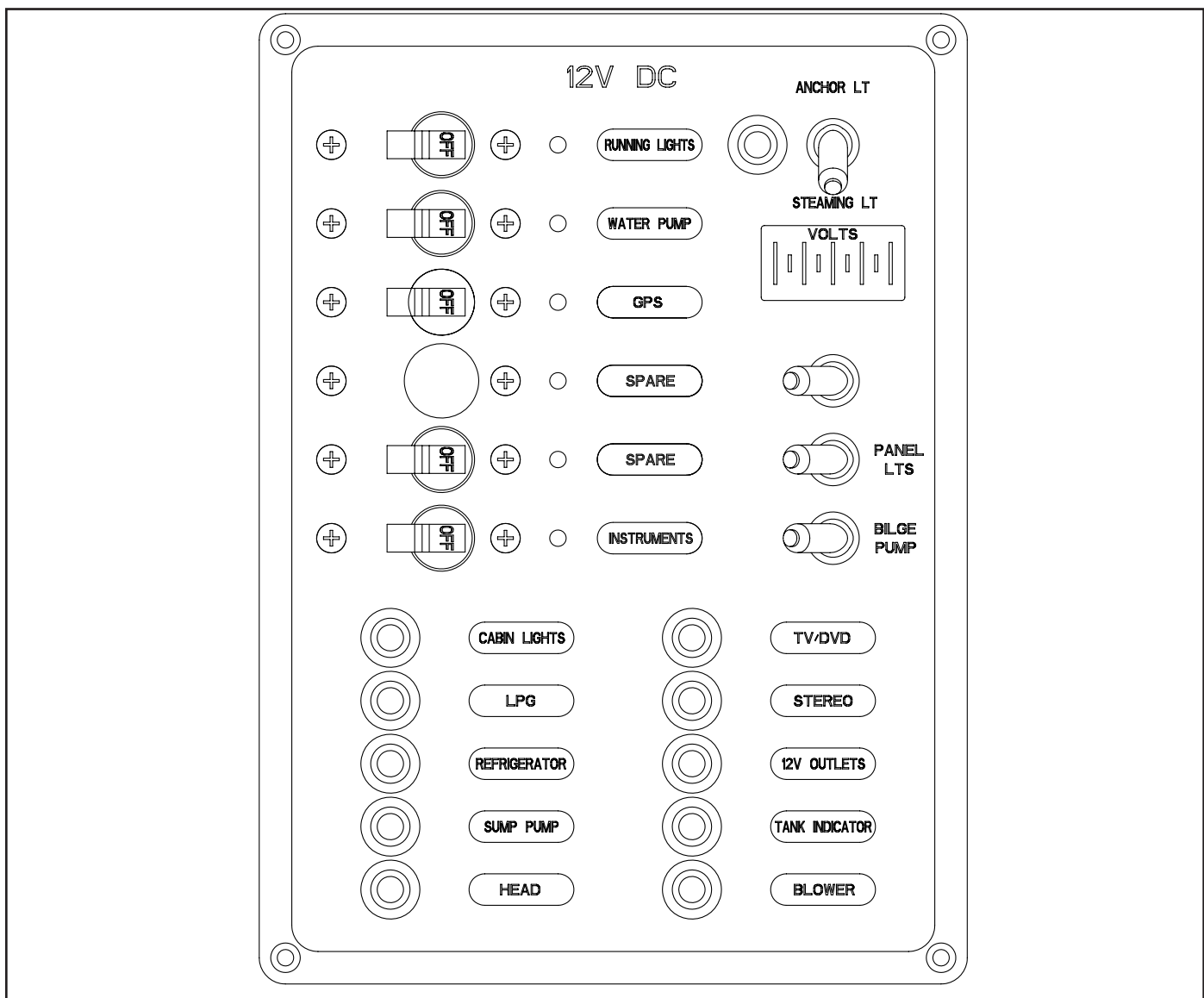


Figure 7.10

A secondary feature of the inverter is its battery charging capability. The batteries will charge if shore power or the optional generator is connected and the AC Panel is energized.

### 7.2.7.1 Inverter Basic Operation

1. Choose the source battery(ies) by positioning the Battery Switch to "1" (Start Battery) or "2" (House Battery) to provide power from one battery or position the Battery Switch to the "1+2" position to supply power from both batteries.
2. Turn on the inverter's Invert mode by pressing the

Power button for one second (a yellow status LED lights up) (Fig. 7.11).

3. Turn on the AC MAIN breaker on the AC Panel (see the AC Electric System chapter in this manual).
4. Turn on the appropriate appliance breaker on the AC Panel.

**NOTE:** Consult the inverter manufacturer's OEM manual for inverter operation, care and maintenance.



Figure 7.11

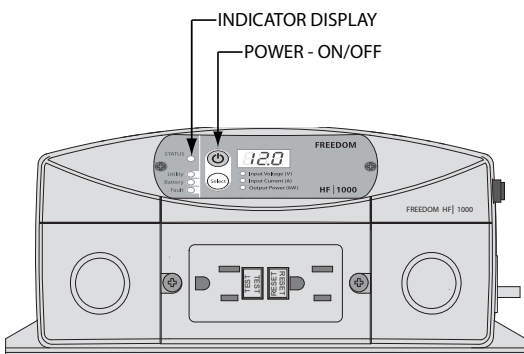


Figure 7.12

## 7.2.8 Engine Control Panel

Although the engine control panel is not a master panel, it is included in this section given the tight integration of the engine to the battery banks. It is located on the starboard forward cockpit face (Fig. 7.13).

Power is provided to the engine control panel by positioning the battery selector switch on the BSP to the desired setting. Either position the Battery Switch to “1” (Start Battery) or “2” (House Battery) to provide power from one battery or position the Battery Switch to the “1+2” position to supply starting power from both batteries.



Figure 7.13

Once done, press the “POWER SWITCH” button on the Engine Control Panel (Fig. 7.14) to energize the panel. At this point, the engine may be started or stopped. See the Engines & Transmissions section of this manual for general engine operation details and the Getting Underway chapter of this manual for engine starting and stopping.

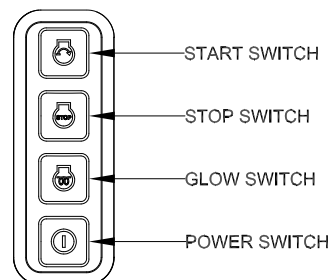


Figure 7.14

### 7.2.8.1 Engine Starter Interrupt Switch

A separate interrupt switch exists to turn off power to the Engine Control Panel. When turned OFF, this safety and security feature allows power to the boat's DC components without allowing the engine to start. This is desirable, for instance, if one steps away from the boat for a short period requiring some electrical components to operate (i.e. refrigerator) while inhibiting an unauthorized use of the boat's engine (i.e. theft) at the same time.

The Interrupt Switch is located in the aft cabin and

## DC Electric Systems

mounted on the inboard face of the engine compartment/companionway bulkhead to the immediate right of the BSP (Fig. 7.5).

### 7.2.10 Generator

The optional generator supplies AC power to the boat. However, as with the boat engine, the generator engine requires power from the DC system to start and is consequently briefly mentioned here. For a full discussion of the optional generator system, please refer to the AC Electrical Systems section of this manual.

### 7.2.11 Grounds and Zincs

The negative ground system incorporates busbars in various locations within the boat (Fig. 7.15). These are identified by the congregation of yellow (negative) wires attached to the bar. All electrical circuits require a ground, and they are joined in sections at these busbars.

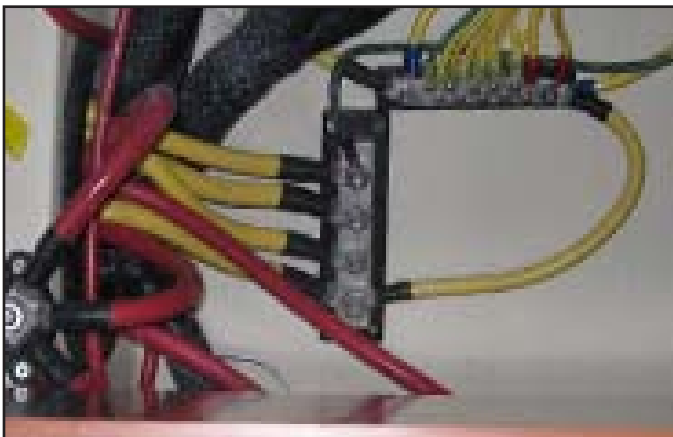


Figure 7.15

Sacrificial zinc anodes are included within some component assemblies to protect them from the effects of galvanic corrosion. Galvanic corrosion occurs primarily in salt water but can occur to a lesser degree in fresh water. Salt water allows electric current to flow from anodic to cathodic material. Any two metals from two components and their relative position in the galvanic rating table will determine which metal loses material (anode) and which metal remains largely undisturbed (cathode). The distance apart in the galvanic table of the two metals determines the rate of wear.

Consequently, zinc anodes are used as the sacrificial metal allowing corrosion of the anodes but limiting corrosion of the more costly underwater components. The sacrificial zinc anodes are considerably easier and less

expensive to replace and their deterioration will not affect the performance of your boat as would the deterioration of any underwater components. The zinc anodes are replaced on a periodic basis (see the Maintenance section in this manual).

*Important: DO NOT PAINT any part of the sacrificial zinc anode as it will retard the flow of electric current through them and render them less effective.*

## 7.3 DC System Components and Operation

The majority of the controls for DC components are located on the two master panels.

### 7.3.1 Battery Switch Panel (BSP) Controlled Components

Please refer to the panel layout in Fig. 7.4 for reference in the following discussion.

#### 7.3.1.1 DC Main Breaker

As previously mentioned, the DCP is supplied power through the BSP. The 50 amp breaker on the panel is labeled “DC MAIN”. To operate the majority of the DC components in your boat controlled from the DC Panel, this breaker must be “ON”.

##### 7.3.1.1.1 To Energize the Main DC Panel

1. Choose the source battery(ies) by positioning the Battery Switch to “1” (Start Battery) or “2” (House Battery) to provide power from one battery or position the Battery Switch to the “1+2” position to supply power from both batteries.
2. Toggle the “DC MAIN” breaker switch to “ON”.

#### 7.3.1.2 Battery Charger Breaker

As mentioned previously, two 40 amp reset breakers exist on the BSP labeled “BATTERY CHARGER OUTPUT RESET”. Refer to the Battery Charger discussion above for additional details on these breakers.

#### 7.3.1.3 Bilge Pump Breakers

The bilge pump system essentially consists of a main bilge pump, together with a high-water alarm component. Additionally, an optional high water bilge pump is avail-



## DC Electric Systems

able. All pump systems are immediately energized from the battery banks.

Reset breakers are integrated within the BSP to protect the main bilge pump, labeled “BILGE PUMP”, with a 5 amp breaker and the high water alarm (and optional high water alarm pump), labeled “HIGH WATER ALARM”, with a 10 amp breaker.

The high water alarm system also has control and display circuitry found on the Fuel/Safety Panel, located on the forward starboard cockpit (Fig. 7.16). The alarm system can be periodically tested using the push button labeled “TEST”. When pushed, an audible alarm accompanied with an illuminated CHECK BILGE light indicates proper operation. Release the button to end the test and return to the default AUTO position.

A 10 amp reset breaker exists for the high water alarm system on the Fuel/Safety Panel itself for an additional level of protection.

The optional high water bilge pump is available to act as an extra layer of protection from water breach. If water collection is sufficient to overwhelm the main bilge pump and rise to a determined level, the high water alarm will sound and the optional high water bilge pump will activate to begin pumping at a higher rate than the standard main bilge pump.

For additional details on the bilge pump system, please refer to the Waste Systems chapter of this manual.



Figure 7.16

### 7.3.1.4 Carbon Monoxide (CO) Monitors Breaker

Your boat comes with CO detectors installed in all sleeping areas. The CO monitors are immediately energized from the battery banks. A 5 amp reset breaker labeled “CO ALARM” protects them from a power fault. Please

refer to the Safety chapter of this manual for a thorough discussion on the hazards and precautions of this dangerous gas.

*NOTE: Consult the CO detector manufacturer's OEM manual for detector operation, care and maintenance.*

*NOTE: Do not spray waxes or cleaning agents on the CO monitors.*

### 7.3.1.5 Spare Breaker Positions

The BSP has spare positions available for the installation of additional components.

## 7.3.2 DC Panel Controlled Components

Please refer to the panel layout in Figure 7.10 for reference in the following discussion. Please also note all switch breakers discussed below will have a corresponding LED to the side of the switch to indicate an energized system if switched ON.

*NOTE: Always turn off circuit breaker switches when leaving your boat unattended.*

### 7.3.2.1 Volt Meter

A volt meter is located on the upper right side of the panel. Once the DCP is powered, the volt meter indicates the voltage of the battery bank(s) as designated by the position of the BSP's Battery Switch. At position “1”, the volt meter indicates the Start Battery voltage, position “2”, the House Battery and position “1+2” indicates the average of the Start and House batteries combined. A charged battery will display a reading over 12 volts.

### 7.3.2.2 Lighting Systems - Deck Light, Running Lights, Anchor Light, Steaming Lights & Cabin Lights Breakers

For consistency, we will discuss all switch breakers and reset breakers for lighting systems aboard your boat. There are basically two distinct lighting systems:

1. Navigational lighting
2. Boat based visibility lighting

#### 7.3.2.2.1 Safety and Navigational Lighting - Running Lights, Anchor Light & Steaming Light Breakers

The navigational lighting consists of the following indi-

## DC Electric Systems

vidual light components (see also the Boating Safety chapter of this manual for additional information on navigational lighting):

1. Running lights - the standard starboard (green), port (red) lights and stern (white) lights located on the deck
2. Anchor light - the 360 degree light located on the top of the mast
3. Steaming light - the 225 degree light located on the the top of the mast under the anchor light.

A 5 amp switch breaker provides power to the running lights. It is labeled “RUNNING LIGHTS” on the panel and protects this system from a power fault.

Control of the anchor light and steaming light is through a vertical 3-position toggle switch. Setting the switch in the up position will illuminate the anchor light; middle position is off; down position will illuminate the steaming light. When either light is illuminated, an LED light on the toggle switch will illuminate to indicate an energized system. A 5 amp pop-out breaker located to the left of the toggle switch protects the anchor light/steaming light circuitry from a power fault.

The nav light configuration will depend on the status of the boat at night:

1. Anchored - anchor light only
2. Under sail - running lights and steaming light
3. Under power - running lights and anchor light

### 7.3.2.2.2 Boat Based Visibility Lighting - Cockpit and Cabin Lights Breaker

Cabin lights, cockpit storage light and optional arch speaker pod light are all energized once the DC panel is energized. A 20 amp reset breaker labeled “CABIN LIGHTS” protect these circuits from a power fault.

Individual wall or fixture switches allow lights ON/OFF. One single switch wall light plate (left plate Fig. 7.17) exists in the galley and is located on the upper cabinet lower face. The switch controls the dish rack mini light located within the upper galley cabinet.

The balance of the interior light fixtures (also cockpit storage and optional arch speaker pod light) have ON/OFF switches on the fixture. Refer to Figure 7.20 for light fixture location and details.



Figure 7.17

### 7.3.2.3 Fresh Water Pump Breaker

This 10 amp switch breaker controls power to the fresh water pump. It is labeled “WATER PUMP” on the DC Panel and protects it from a power fault. The water pump pressurizes the fresh water system (refer to the Water Systems chapter in this manual for additional details).

*NOTE: Consult the pump manufacturers' OEM manual for pump operation, care and maintenance.*

### 7.3.2.4 GPS/Chartplotter Switch/Breaker

This 10 amp switch breaker controls power to the optional chartplotter ( wide-screen display). It is labeled “GPS” on the panel and protects the chartplotter from a power fault. The GPS is generally bundled with the chartplotter (with or without radar).

*NOTE: Consult the chartplotter manufacturers' OEM manual for instrument operation, care and maintenance.*

### 7.3.2.5 Autopilot/Instruments Switch/Breaker

This 5 amp switch breaker controls power to the standard knot/depth display and/or the optional Autopilot component and protects them from a power fault. It is labeled “INSTRUMENTS” for only the knot/depth display and “AUTOPILOT” for the optional autopilot and knot/depth display (unless the optional chartplotter is installed).

*NOTE: Consult the instrument manufacturers' OEM manual for instrument operation, care and maintenance.*

### 7.3.2.6 Panel Lights Switch

Half way down the right side of the panel is the two-position toggle switch (“ON-OFF”) for panel lights. The power for the panel backlights for both the DC panel and AC

## DC Electric Systems

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panel are provided by the DC system and controlled with the toggle switch labeled “PANEL LTS”. This circuitry is protected by a 5 amp fuse located on the back of the panel.

### 7.3.2.7 Bilge Pump Switch

Half way down the right side of the panel, immediately below the Panel Lights switch, is the momentary toggle switch for the main bilge pump. This switch allows manual control of the bilge pump and is energized regardless if the DC Panel is energized or not. Toggling to the right is the momentary ON position and engages the bilge pump while illuminating the LED on the toggle tip, indicating an energized state. Releasing the toggle switch returns to the OFF position and disengages the bilge pump.

The circuit breaker for the main bilge pump is located on the Battery Switch Panel.

For additional details on the bilge pump system, please refer to the Waste Systems chapter of this manual.

*NOTE: Consult the pump manufacturers' OEM manual for instrument operation, care and maintenance.*

### 7.3.2.8 LPG Gas Breaker

The breaker for the LPG remote panel protects the panel from a power fault. The 5 amp pop-out breaker is labeled “LPG GAS”. The LPG panel is an ON/OFF switch allowing for remote control of LPG flow to the stove.

Please see the Fuel chapter in this manual for information on LPG hazards and use of the LPG system.

### 7.3.2.9 Refrigerator Breaker

This 15 amp switch breaker provides power to the optional refrigerator/freezer units. It is labeled “REFRIGERATOR” on the panel and protects them from a power fault.

#### 7.3.2.9.1 Basic Refrigerator Operation

1. Choose the source battery(ies) by positioning the Battery Switch to “1” (Start Battery) or “2” (House Battery) to provide power from one battery or position the Battery Switch to the “1+2” position to supply power from both batteries.
2. Position the “DC MAIN” breaker switch on the BSP to the “ON” position.

3. Position the “REFRIGERATOR” breaker switch to the “ON” position.
4. To turn your refrigerator on, turn the fridge's internal temperature control knob clockwise to the desired cooler level.
5. To turn your refrigerator off, turn the fridge's internal temperature control knob fully counterclockwise.

*NOTE: If leaving the refrigerator on when away from the boat, ensure the shore power cables are connected. (If equipped with a battery charger, turn it on to prevent battery drain. If equipped with an inverter, the batteries will automatically charge if the AC panel is energized.)*

*NOTE: Consult the refrigerator manufacturer's OEM manual for fridge operation, care and maintenance.*

### 7.3.2.10 Sump Pump Breaker

Once the DC panel is energized, the sump pump, or collection box/pump system, is also energized. A 10 amp reset breaker labeled “SUMP PUMP” protects it from a power fault. The collection box/pump system serves to automatically discharge grey water originating from the vanity sink, shower and condensation from the optional air conditioning system which all drain into the collection box.

For additional details on the collection box/pump system, please refer to the Waste Systems chapter of this manual.

*NOTE: Consult the pump manufacturers' OEM manual for instrument operation, care and maintenance.*

### 7.3.2.11 Electric Toilet Breaker

Once the DC panel is energized, the optional electric toilet electrical components are also energized. A 25 amp pop-out breaker labeled “HEAD” protects them from a power fault.

For additional details on the toilet system, please refer to the Waste Systems chapter of this manual.

*NOTE: Consult the electrical toilet manufacturer's OEM manual for component operation, care and maintenance.*

### 7.3.2.12 TV/DVD Breaker

This 10 amp reset breaker controls the optional video entertainment components of your boat. The breaker is labeled “TV/DVD” and protects the TV and DVD circuitry

from a power fault.

*NOTE: Consult the entertainment component manufacturer's OEM manual for component operation, care and maintenance.*

### 7.3.2.13 Stereo Breaker

This 10 amp reset breaker controls the optional audio entertainment components of your boat. The breaker is labeled “STEREO” and protects the stereo player and speakers from a power fault.

With the optional stereo comes the need for maintaining the stereo memory for channeling and clock. The stereo memory is immediately energized from the battery banks through the bilge pump circuitry and is protected by an in-line fuse.

*NOTE: Consult the entertainment component manufacturer's OEM manual for component operation, care and maintenance.*

### 7.3.2.14 12V Outlet Breaker

Your boat comes equipped with 3 12v outlets (see Fig. 7.21 for outlet locations). Once the DC panel is energized, these outlets are also energized. A 15 amp pop-out breaker labeled “12V OUTLETS” protects the system from a power fault.

### 7.3.2.15 Tank Monitor Breaker

Once the DC panel is energized, the water tank gauge, located in the galley to the left of the AC Panel (Fig. 7.18), is also energized. A reset breaker labeled “TANK MONITOR” protects the gauge from a power fault.

### 7.3.2.16 Blower Breaker

The breaker for the engine compartment blower protects this ventilation system from a power fault. The 5 amp reset breaker is labeled “BLOWER”.

Ventilation is very important within your boat. Given the potential hazards of Carbon Monoxide buildup (See Boating Safety chapter in this manual) on one hand, and the simple comfort of fresh air or air conditioning on the other, ventilation is a necessary standard.



Figure 7.18

On your boat, there are essentially three categories of ventilation:

1. Air conditioning system
2. Hatches and dorade vents
3. Engine compartment blower

The optional air conditioning system is AC powered (see AC Electric chapter in this manual). The hatches are manual and require no power.

The engine compartment blower is an exhaust fan which removes exhaust fumes and hot air from the engine compartment. This in-line blower pushes air from the engine compartment through a 4” hose to a vent located within the starboard transom garage (refer to the Waste Systems chapter in this manual for additional information on the blower).

## ⚠ WARNING ⚠

**Fuel fumes in the engine compartment can explode. Before working on electrical wiring, ventilate engine bay and disconnect battery cables to prevent sparks.**

### 7.3.2.17 Spare Breaker Positions

The DC panel may have spare positions available for both switch breakers and reset breakers, depending on existing options installed.

## 7.4 Other DC System Components



The following components do not have a dedicated switch or fuse on the main panels and are generally protected within the OEM wiring or separate breakers/fuses. We will introduce these components and the method and location of power and circuit protection.

### 7.4.1 Windlass Breaker

The optional anchor windlass is supplied power through a breaker separate from the main panels. This 110 amp windlass breaker is located in the aft cabin and mounted on the inboard face of the engine compartment/companionway bulkhead and to the immediate right of the BSP (Fig. 7.5).

To operate the windlass, rotate the yellow trip lever counterclockwise into its cover flap. To de-energize the windless, depress the red breaker button (the yellow trip lever will flip downward). For additional details about the optional windlass and anchoring, please refer to the Underwater Gear chapter in this manual.

*NOTE: If windlass becomes inoperable electrically, a manual winch handle is supplied (see Underwater Gear chapter in this manual for further details).*

*NOTE: Consult the windlass manufacturer's OEM manual for windlass operation, care and maintenance.*

### 7.4.2 Engine Compartment Automatic Fire Extinguishing System

The optional automatic fire extinguishing system consists of a cylinder, mounting bracket, relay and remote circuitry. It is powered through direct connection to the engine starter and incorporates a 5 amp in-line fuse located near the engine starter within the engine compartment.

The remote is part of the Fuel/Safety Panel (Fig. 7.16) located on the forward starboard cockpit. If the engine starter is energize but the fire extinguisher remote panel "READY" light is not illuminated, check the system wiring and in-line fuse and replace if necessary.

When a fire is detected on your boat, the automatic system will sound an alarm, discharge the extinguisher and illuminate the "DISCHARGE" LED on the Fuel/Safety Panel. The relay will shut down the engine, the blower and the optional generator.

When the critical portion of the emergency has passed, the alarm and illuminated "DISCHARGE" light can be turned off by setting the switch to the

"OVERRIDE" position. To reset the system, a full extinguisher cylinder must be installed. Set the switch to "NORMAL" and verify the "READY" LED is illuminated.

*NOTE: Consult the automatic fire extinguisher system manufacturer's OEM manual for system operation and maintenance.*

### 7.4.2 VHF Radio

The circuitry for the optional VHF radio is protected by a 10 amp inline fuse. The fuse is located within the port electronic component's cabinet and accessed through the cabinet face.

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## 7.5 General Maintenance

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Maintenance of your DC system simply involves ensuring all connections are clean, tight, and covered with a corrosion inhibiting compound.

Troubleshooting		
Problem	Cause	Solution
12 volt equipment not working	Battery selector switch turned off	Check battery selector switches and ensure they are on.
Battery not charging with engine running	Check alternator, belt, etc.	Change alternator, tighten belt.
Battery not holding a charge	Faulty Battery Faulty battery charger	Replace battery. Have your dealer check battery charger.
12 volt DC device not working	Circuit breaker for device is off Weak or dead battery  Faulty electrical connection	Switch breaker to on. Change battery selector switch position and recharge battery. Check 12 volt DC connections, tighten or repair as needed.
Cabin lights not working (off or dim)	Cabin reset breaker for device is off Weak or dead battery  Light bulb burned out	Push in reset. Change battery selector switch position and recharge battery. Replace bulb.
Blower inoperative	Tripped reset breaker Weak or dead battery	Push in reset. Recharge or replace battery.

# DC SYSTEM MAJOR COMPONENT GENERAL LAYOUT

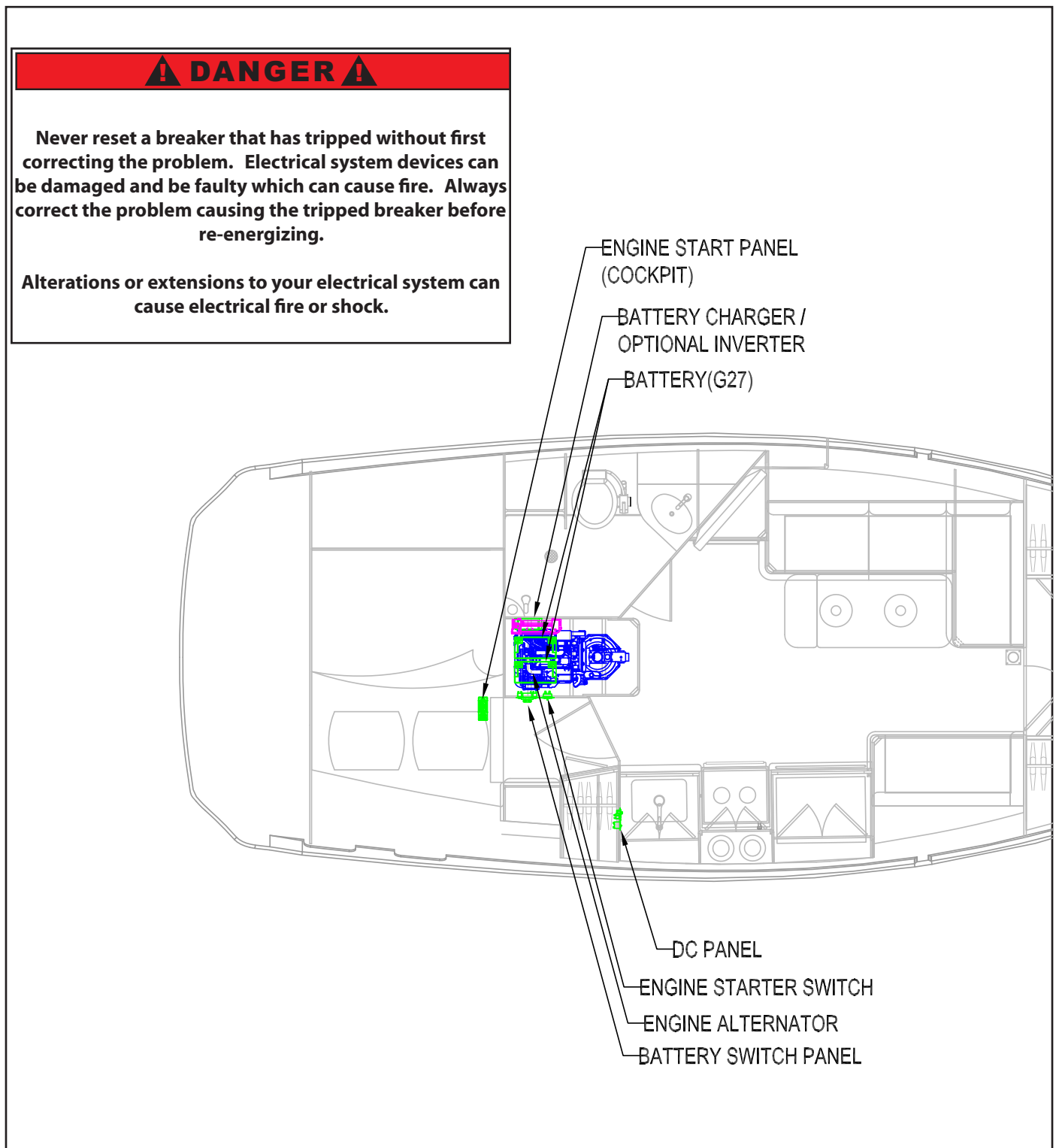



Figure 7.19

# INTERIOR/EXTERIOR LIGHTING LAYOUT

#	TYPE	QTY	PIC
1	3" CIR- CULAR / CHROME W/ SWITCH	12	
2	6" READ- ING	6	
3	5 1/2" LIGHT (COCKPIT STOR- AGE)	1	
4	18" FLUO- RESCENT (VANITY)	1	
5	MINI (DISH RACK)	1	
6	STERN LIGHT (TRAN- SOM)	1	
7	BOW LIGHT (BOW- RAIL)	1	

#	TYPE	QTY	PIC
8	STEAM- ING/AN- CHOR LIGHT (MAST- HEAD)	1	

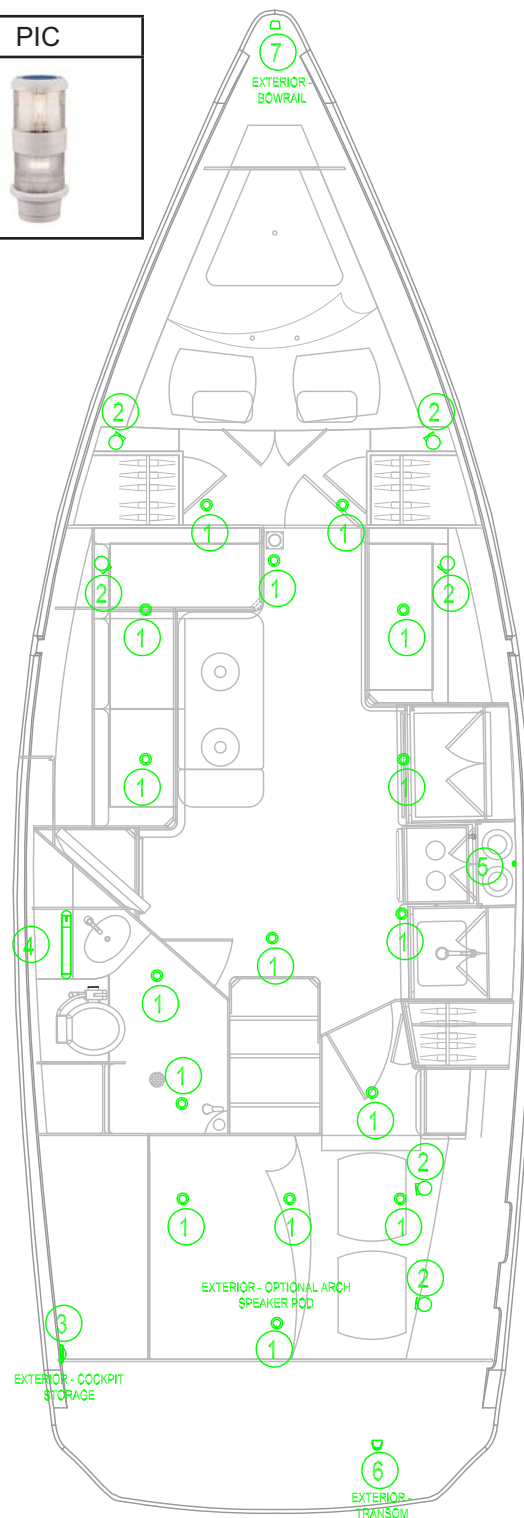


Figure 7.20

## DC OUTLET LAYOUT

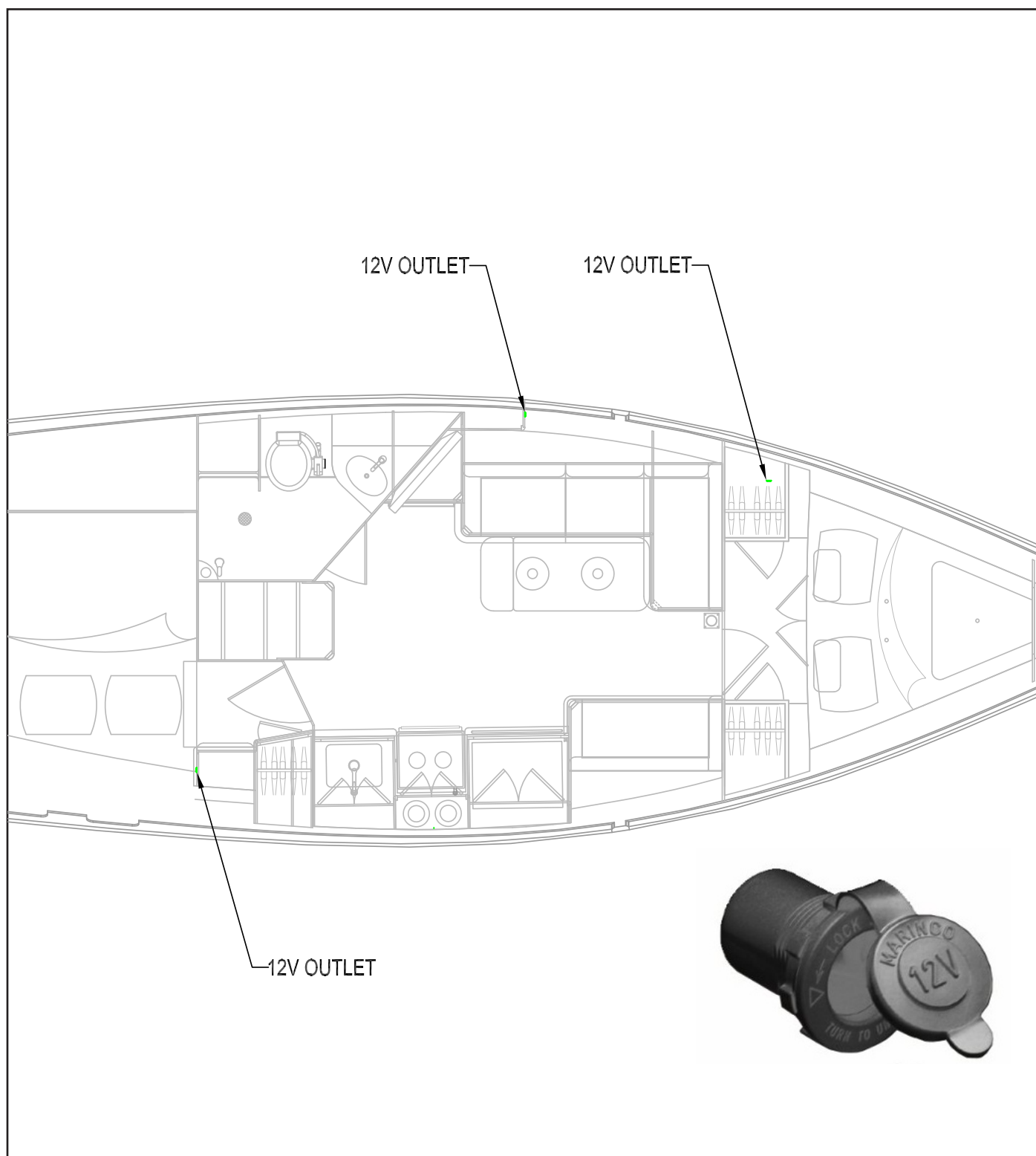


Figure 7.21





MARLOW-HUNTER, LLC

*Chapter 8*

# *AC Electric System*

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## AC Electric Systems

In addition to the 12 Volt DC negative ground system, your boat is equipped with a 120V 60 HZ AC system as standard and a 230V 50 HZ as an option.

The purpose of this chapter is to provide information necessary to understand and operate the AC electrical system aboard your boat. This system comprises your boat's electrical components which are powered by 120V (or 230V) AC power. We will organize this section into the following topics:

1. AC Power System Overview
2. AC Power Supply Equipment and Components
3. AC System Components and Operation

The purpose of this chapter is not to educate on the repair or the expansion of the electrical system. Nor is its purpose to educate on the basics of electricity. Again, the purpose is to provide you with the information to safely operate and maintain the AC electrical system.

### **⚠ WARNING ⚠**

**Electricity cannot be detected without the use of specialized test equipment. Never think you know whether a circuit is "live". Always have qualified, competent professionals inspect or make repairs to your electrical systems.**

### **⚠ WARNING ⚠**

**Do not rely on the information in this manual as a repair guide. As always, only competent electrical service personnel should attempt to repair any electrical equipment or to expand the electrical system. Work performed by non-electrical service personnel may result in electrical shock or damage to the boats systems or components.**

## 8.1 AC Power System Overview

Please refer to 8.18 for the basic power supply equipment and component layout as reference for this section.

The sources of power for the three-wire grounded AC systems aboard your boat are the following:

1. Shore Power
2. Generator (Option)
3. Inverter (Option)

The overall control of that power is found in the AC Panel. Your AC Panel will be either a single line panel (Fig. 8.4) or double line panel (Fig. 8.5), depending on the installation of the optional air conditioning, electric stove or generator. Individual remote panels for the optional generator and inverter are also involved in the specific control of these systems.

Please note Fig. 8.1 for the individual systems/components controlled by the AC Panel and their corresponding resettable breaker amperage.

<u>System</u>	<u>Line</u>	<u>Brk</u> <u>120V</u> <u>(AMP)</u>	<u>Brk</u> <u>230V</u> <u>(AMP)</u>
AC Main	1 & 2	30 DBL	15 DBL
Generator (Option)	1	50 DBL	30 DBL
Parallel	2	30 DBL	15 DBL
Outlets	1	15	10
Microwave (Option)	1	15	10
Battery Charger	1	15	10
Water Heater	1	15	10
Air Conditioner (Option)	2	25	15

Figure 8.1

## 8.2 AC Power Supply Equipment and Components

### 8.2.1 Shore Power

Power to energize your boat's AC system can come from either a dockside shore power inlet or the optional generator (if installed on your boat). A dockside shore power connection is the standard method. Figure 8.2 shows the inlet configuration of three hookups: line 1, 2 and TV. Line 1 inlet is the standard hookup for the boat's AC system. Line 2 is installed when the boat is equipped with the optional air conditioning. The TV inlet is installed when the boat is equipped with the TV option.

#### 8.2.1.1 Shore Power Inlet Breaker(s)

The boat's AC circuitry is protected from a shore connection power fault by a 30 amp resettable shore power

## AC Electric Systems

circuit breaker switch panel (Fig. 8.3). The panel will have one or two breakers, depending on the existence of the air conditioning option. The panel is located in the aft cabin's starboard aft bulkhead.

*NOTE: It is important that you review the "Electric Shock" pamphlet included within your manuals documents and understand the importance of electrical safety. While electricity provides tremendous convenience, it has the potential to injure and kill. Be sure and follow the warnings posted in this manual and in the manufacturer's OEM manuals included in you manual pack and practice good safety measures. Always have trained, competent technicians service your electrical systems.*



Figure 8.2



Figure 8.3

### **⚠ DANGER ⚠**

**Never work on an energized circuit! Always treat any circuit as if it were live! Always have trained, competent technicians to service your electrical systems!**

#### 8.2.1.2 Connect and Turn on Shore Power

1. Turn off all equipment breakers on the AC Panel (Fig. 8.5).
2. Turn off "AC MAIN" breaker(s) on the AC Panel.
3. Turn off shore power inlet breaker(s) (Fig. 8.3).
4. Plug power cable (Fig. 8.4) into shore power inlet.
5. Turn clockwise to lock (standard inlet) or snap into place (Smartplug).
6. Thread the locking ring onto the boat receptacle to prevent accidental unplugging (standard inlet).
7. Plug power cable (Fig. 8.4) into dock side power outlet.
8. Turn on shore power breaker on the dock.
9. Turn on shore power inlet breaker(s).
10. Turn on "AC MAIN" breaker(s).
11. Turn on desired equipment breakers.

#### 8.2.1.3 Disconnect Shore Power

Complete the above connection instructions in reverse and with opposite actions (turn off vs. turn on, etc.).

### **⚠ WARNING ⚠**

**Using a damaged or improper cord for shore power can cause electrical shock and serious injury. Use a cord specifically designed for shore power connection. Do not use a household extension cord.**

### **⚠ CAUTION ⚠**

**Water is an excellent conductor of electricity. Keep shore power cord out of water. Do not operate any AC device while you or the cord are in water. To**

prevent injury or equipment damage, keep all AC system components dry.

electrical shock and serious personal injury.

**⚠ WARNING ⚠**

**DO NOT** connect the shore power cord to the dock side electrical source first. You could accidentally drop the cord into the water, which may result in

**8.2.1.4 Shore Power Cable**

The shore power cable (standard cord right side Fig. 8.6 / optional Smartplug cord right side) is intended for use outdoors. However, to prolong the life of the set, store indoors when not in use. The metallic parts of your cable

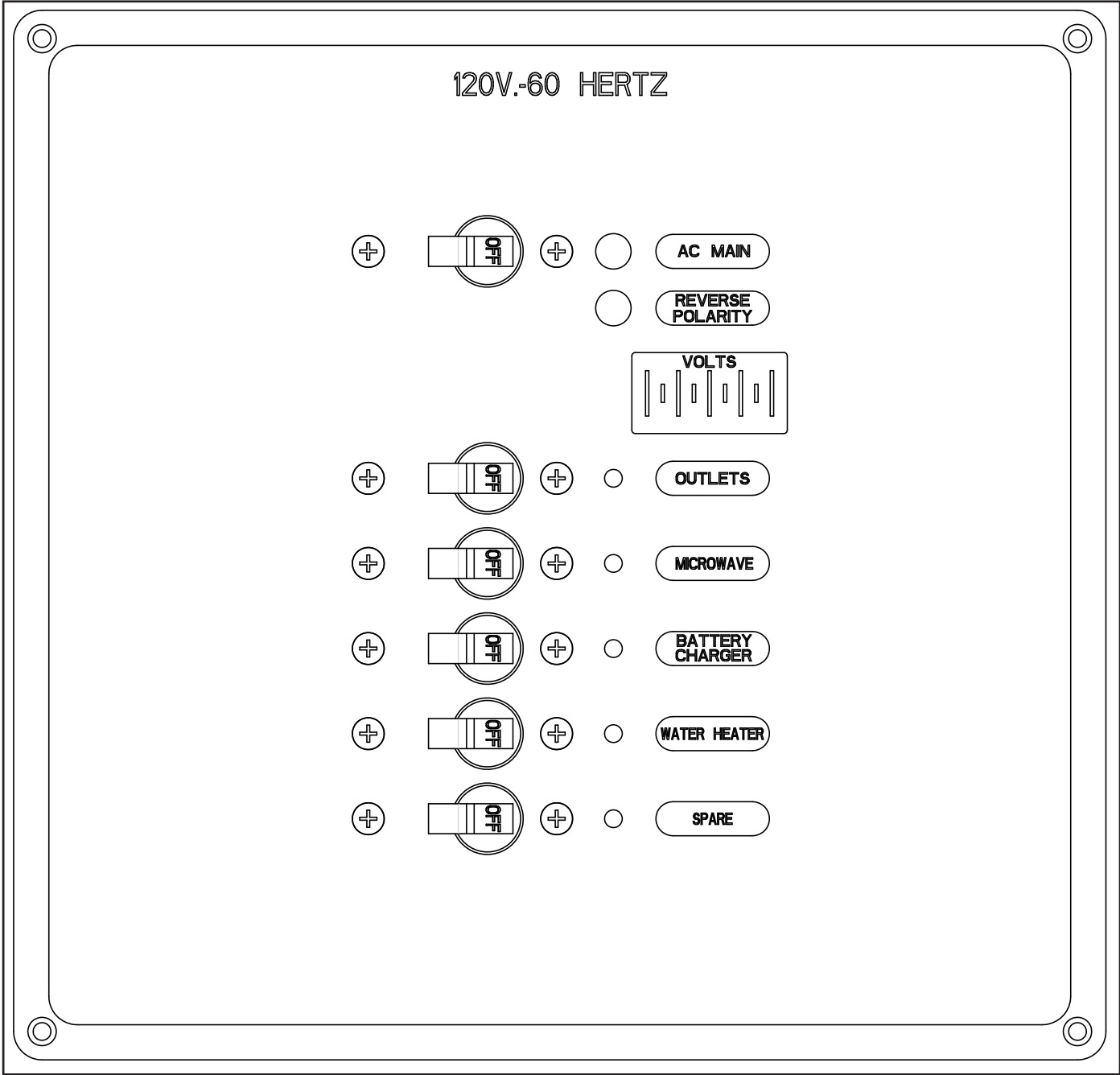


Figure 8.4

## AC Electric Systems

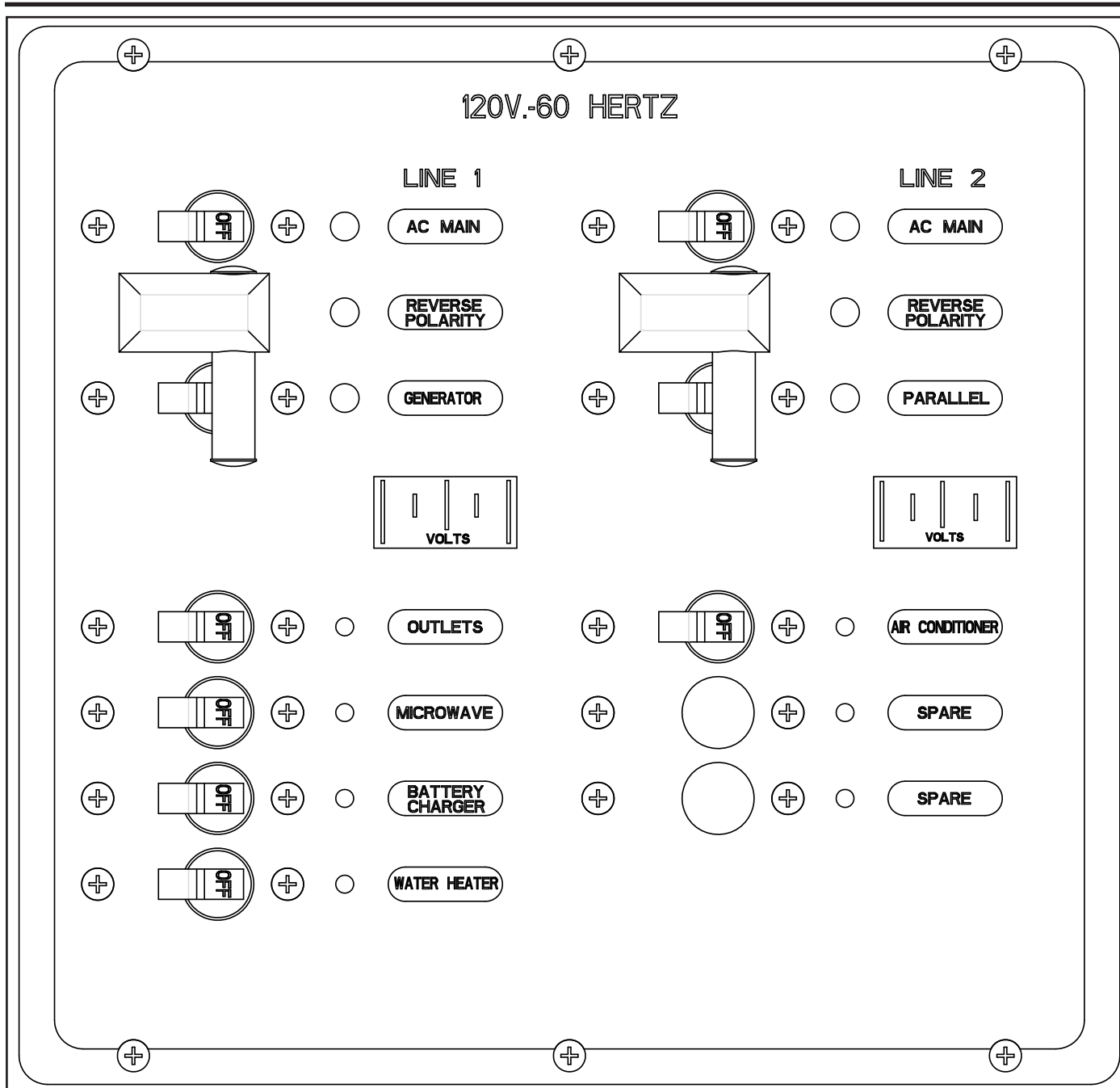


Figure 8.5

set are made to resist corrosion. In a salt-water environment, however, periodic rinsing of the exposed parts with fresh water, drying and spraying with a moisture repellent can increase the life of the product.

Similarly, in case of salt water immersion, rinse plug end and/or connector end thoroughly in fresh water, shake or blow out excess water and allow to dry. Spray with moisture repellent before re-use. A soiled cable can be

cleaned with a grease cutting household detergent. A periodic application of vinyl protector to both ends will help to maintain cables original appearance. Perform maintenance only after the cable is unplugged from its power source.

**⚠ WARNING ⚠**

**DO NOT allow the dock side power cord to come**



## AC Electric Systems

**in contact with the water. Never operate any power tool or other electrical equipment while you or the devices are in contact with the water, as this may cause electrocution resulting in shock or death.**



Figure 8.6

### 8.2.3 Main AC Panel

Once AC power is sourced, power is routed to the AC Panel main breakers. The AC Panel is the lower panel located on the aft galley bulkhead (Fig. 8.7 and 8.8).

#### 8.2.3.1 Panel Lights

The power for the panel backlights for both the AC Panel and DC Panel are provided by the DC system. Control of the backlights is through a two-position toggle switch labeled “PANEL LTS” located on the DC Panel (see DC Electric Systems chapter of this manual). This switch is located middle right side of the DC Panel.

#### 8.2.3.2 Volt Meter

A volt meter is located on the panel for each line. Line voltage is displayed regardless of the “AC MAIN” breaker setting.

#### 8.2.3.3 Breakers, Switches and Fuses

All panels and systems are wired in compliance with the standards and practices as outlined by ABYC and the European ISO standards. As such, all electrical systems aboard your boat are equipped with over-current protection in the form of breakers or fuses. Specific systems or components have been equipped with breaker switches for convenience in manual interaction. A blue LED is associated with each switch breaker and will illuminate when the breaker is in the “ON” position.

#### 8.2.3.4 Main AC Panel Breaker(s)

Each line on the main AC Panel has a 30 amp toggle double-breaker switch labeled “AC MAIN”. Once these breakers are switched on, the corresponding AC Panel component breaker are energized.



Figure 8.7



Figure 8.8

### 8.2.4 Battery Power (DC System)

The AC system and battery powered DC system will

## AC Electric Systems

interact at times. These interactions will effect the level of charge in the batteries. If the battery banks aboard your boat loose charge (as power is used to energize the DC system or inverted for the AC system), they can be recharged through either the shore power connection, the engine alternator or the optional generator.

Charging the batteries through shore power or the generator is accomplished through either the battery charger or the inverter. Charging the batteries through the engine alternator is by direct connection. The relevant later sections will clarify the battery charging process.

### 8.2.5 Generator

An alternative source of power for the AC system is the optional generator (Fig. 8.9). The generator system includes the generator, plumbing (water and fuel), exhaust, wiring and a remote panel.

The generator will be located in the port aft storage region and accessed through the cockpit's port seat lid. The remote panel is located on galley aft bulkhead (Fig. 8.10).



Figure 8.9

#### 8.2.5.1 Generator Basic Operation

When powered up, the energy produced from the generator is routed through the AC Panel's 50 amp toggle

double-breaker switch labeled "Generator". The toggle switch is managed by a slide-bar stopper. This stopper will only allow source power to be either from shore power or from the generator. Switching on the generator toggle breaker switch will energize the AC panel. Actual control of the generator is through the generator remote panel.



Figure 8.10

##### 8.2.5.1.1 Generator Start

**NOTE:** Consult the generator manufacturer's OEM manual for specifications when operating the generator's remote panel.

1. Check generator oil level. Ensure level is in accordance with the manufacturer's specifications.
2. Check the external expansion tank water level. Ensure level is in accordance with the manufacturer's specifications.
3. Check the raw water filter is free of debris (see the Water Systems chapter in this manual).
4. Ensure cooling water intake valve is open.
5. Turn off all AC Panel breakers, including the "GENERATOR" breaker.
6. Turn on the desired battery selector switches (see DC Electric System chapter in this manual).
7. Press the "PANEL ON" button on the generator remote panel (Fig. 8.11). A green LED should illuminate above the button.
8. Press the "PRE-HEAT" button on the generator remote panel, if necessary (as per the manufacturer's specifications). An orange LED should illuminate above the button.
9. Press the "START" button on the generator remote panel. A green LED should illuminate above the button. Refer to the manufacturer's specifications for delay time on re-pressing the start button if the engine does not immediately start.

10. Turn on the “GENERATOR” breaker switch at the AC Panel.
11. Turn on breakers at the AC Panel for the desired AC components.

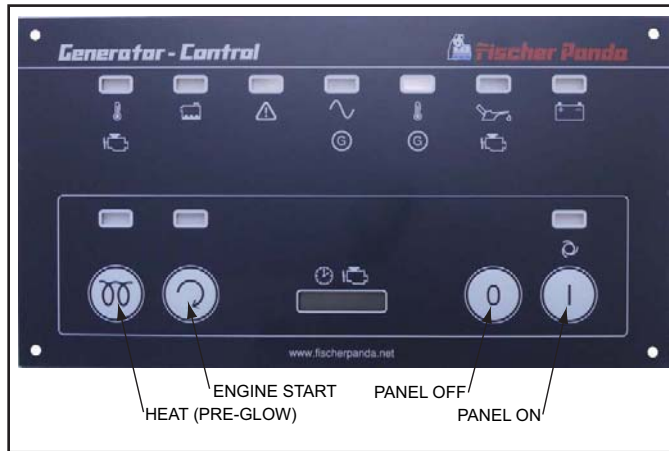


Figure 8.11

### 8.2.5.1.2 Generator Stop

*NOTE: Consult the generator manufacturer's OEM manual for specifications when operating the generator's remote panel.*

1. Turn off component breakers at the AC panel.
2. Turn off the “GENERATOR” breaker switch at the AC Panel.
3. If necessary, allow the generator to run to stabilize its temperature (as per the manufacturer's specifications on temperature and length of stabilization).
4. Press the “PANEL OFF” button on the generator remote panel (Fig. 8.11). The “PANEL ON” LED should extinguish.

### 8.2.5.2 The Parallel Breaker and Optional Air Conditioner Using Generator Power

The generator has sufficient amperage (50 amps) to power both the optional air conditioner and the standard AC system.

To power the optional air conditioner from the generator, perform the following steps:

1. Switch off the “AIR CONDITIONER” breaker switch at the AC Panel.
2. Execute the Generator Start sequence discussed

previous.

3. Switch on the AC Panel's “PARALLEL” toggle switch breaker. The toggle switch is managed by a slide-bar stopper. This stopper will only allow source power to be paralleled from either 1 shore power line with 50 amps or from the generator.
4. Switch on the “AIR CONDITIONER” breaker switch at the AC Panel.

### 8.2.5.3 Charging the Batteries Using Generator Power

1. Execute the Generator Start sequence discussed previous.
2. Switch on the “BATTERY CHARGER” breaker switch at the AC Panel (see Battery Charger discussion below).

*NOTE: Consult the generator manufacturer's OEM manual for generator operation, care and maintenance.*

### 8.2.6 Battery Charger

If you are docked for an extended period of time, operating the DC system and equipment will drain the power from the batteries. Unless the batteries are kept charged, they may not have enough power to start the engines when needed. The battery charger (Fig. 8.12) will automatically charge the battery banks when the AC system is powered by shore power or the generator.



Figure 8.12

The charger is located above the engine box compartment and can be accessed through the hinged access cover (right side Fig. 8.13). A 40 amp pop-out breaker



## AC Electric Systems

exists on the Battery Switch Panel labeled “BATTERY CHARGER” and protects the charging system from a power fault following the AC Panel. A 15 amp toggle switch breaker labeled “BATTERY CHARGER” exists for the battery charger on the AC Panel which protects the battery charger from a power fault.



Figure 8.13

Leaving the battery charger switch breaker on whenever AC power is energized from shore power or generator is a good idea. It will keep the batteries fully charged. After the batteries are recharged, it provides a maintenance or trickle charge as needed.

### 8.2.6.1 Charging the Batteries

1. Set the toggle switch breakers to supply power to the AC Panel from shore power or generator.
2. Switch on the “BATTERY CHARGER” breaker switch at the AC Panel.

### 8.2.7 Inverter

A final source of power for the AC system is the optional inverter (Fig. 8.14). The inverter converts DC power to AC power. The assembly consists of the inverter, wiring and a remote panel. The inverter is located the engine box compartment and can be accessed through the hinged upper access cover. The remote panel is located on the galley aft bulkhead.

#### 8.2.7.1 Turning on the Inverter

1. Turn on the desired battery selector switches (see DC Electric System chapter in this manual).

2. With proper DC power as input to the inverter, the green “POWER” LED will illuminate. Activate the invert mode by pressing the “INVERT ON/OFF” button on the remote panel (Fig. 8.15). The green “INV” LED will illuminate and the LCD display will read “INVERTING”.
3. Turn on the “AC MAIN” switch breaker at the AC Panel.
4. Turn on the appropriate appliance breaker on AC panel.



Figure 8.14

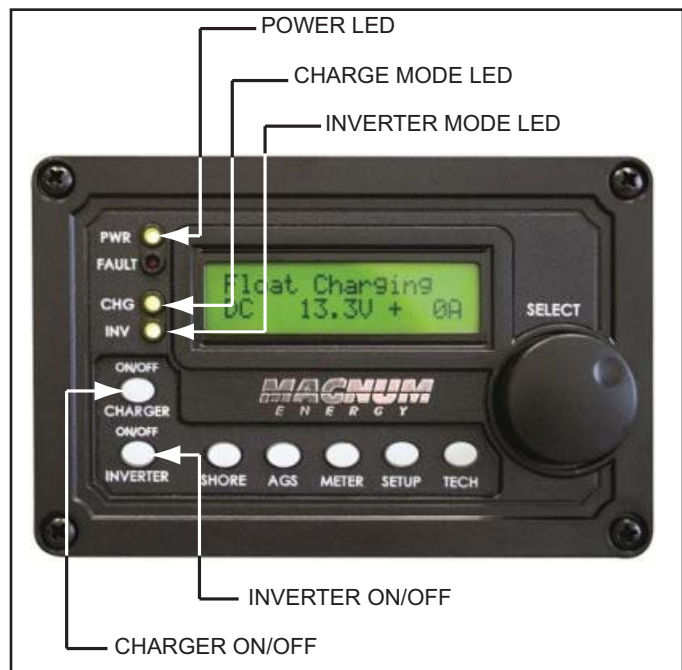


Figure 8.15

**NOTE:** Anticipate an approximate 15 second delay when



*using the inverter.*

*NOTE: Consult the inverter manufacturer's OEM manual for inverter operation, care and maintenance.*

Please note, it takes 10 DC amps to create 1 AC amp. If the battery voltage drops below 10.5V the inverter will automatically shut down. Also the output of the inverter is not capable of powering the water heater or air conditioning system. Both should be powered by shore power or the generator.

### 8.2.7.2 Powering DC Panel and AC Panel Simultaneously When Using the Inverter

When shore power is not connected:

1. Turn on the inverter as outlined above.
2. Switch on the "DC MAIN" switch breaker at the Battery Switch Panel (see DC Electric System chapter in this manual).
3. Turn on breakers at the DC Panel for the desired DC components.

### 8.2.7.3 Built in Inverter Transfer Switch

If shore power or generator is supplying power, the inverter automatically transfers this power to the AC Panel and bypasses the invert mode capabilities.

### 8.2.7.4 Charging the Batteries from the Inverter

If shore power or generator is supplying power, the inverter can be set to charge the batteries. Simply select the charger mode on the inverter remote panel by pressing the "CHARGER ON/OFF" button (Fig. 8.15). The green "CHG" LED will illuminate and the LCD display will read "CHARGING".

*NOTE: When leaving boat unattended, be sure the Invert selection on the remote panel is "OFF". This way, if shore power is lost for any reason, the inverter will be prevented from converting 12V DC to AC voltage and drain the batteries.*

## 8.2.8 Engine Alternator Operation

Batteries can also be charged by the engine alternator. This is the same basic system as an automobile. A direct connection exists between the alternator and batteries resulting in immediate charging when the engines are running. For additional information regarding the engines, please refer to Engines and Transmissions chapter within this manual.

## 8.2.9 The Parallel Breaker and Optional Air Conditioner Using Shore Power

Some dock side shore power sources are of sufficient amperage to power both the optional air condition and the standard AC system.

To power the optional air conditioner from a single shore power cable, perform the following steps:

1. Switch off the "AIR CONDITIONER" breaker switch at the AC Panel.
2. Switch on the AC Panel's "PARALLEL" toggle switch breaker. The toggle switch is managed by a slide-bar stopper. This stopper will only allow source power to be paralleled from either 1 shore power line with 50 amps or from the generator.
3. Switch on the "AIR CONDITIONER" breaker switch at the AC Panel.

*Note: When paralleling shore power, one will need to use a parallel shore power y-adaptor cord.*

## 8.2.10 Reverse Polarity

Each line on the AC Panel includes a LED display for Reverse Polarity. If the Reverse Polarity light is displayed, it indicates a problem exists involving the ground. The problem's origin generally involves the power at dock side or the shore power cord. However, a short in the boat's electrical system may exist between the main AC Panel back to the shore power inlet.

To isolate the cause of the reverse polarity, one must troubleshoot the possible factors for determination. Actions may include testing an alternate shore power source or swapping shore power cords. If the problem appears to be boat side, have your system checked by qualified and competent electrical service personnel.

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## 8.3 AC System Components and Operation

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### 8.3.1 Outlets Breaker (Line 1)

The 120V (230V option) outlets installed throughout your boat are controlled by a 15 amp (10 amp) toggle switch breaker labeled "OUTLETS" on the AC panel (see Fig. 8.19 for outlet locations). In addition, some outlets have

## AC Electric Systems

ground fault interruption circuit (GFIC) protection. This system prevents accidental electrical shock. If power is lost to an outlet, reset the breaker at the GFIC outlet.

### 8.3.2 Microwave Breaker (Line 1)

The microwave is powered by the AC panel and controlled by a 15 amp toggle switch breaker labeled “MICROWAVE”. Although it is plugged into a power outlet, the outlet is not part of a GFI circuit.

*NOTE: Consult the microwave manufacturers' OEM manual for microwave operation, care and maintenance.*

### 8.3.3 Water Heater Breaker (Line 1)

The water heater installed on your boat provides heated water. It is located in the main salon and can be accessed through the port aft dinette seat lid. The water heater is powered by the AC panel and controlled by a 15 amp toggle switch breaker labeled “WATER HEATER”. Although it is plugged into a power outlet, the outlet is not part of a GFI circuit. Please refer to the Water Systems chapter in this manual for additional details regarding the water heater.

*NOTE: Consult the water heater manufacturers' OEM manual for water heater operation, care and maintenance.*

### ⚠ CAUTION ⚠

Be certain the water heater is full of water and does not contain air. If the water heater is not full of water, damage to the heating elements may result when electrical power is turned on to the unit.

### 8.3.4 Air Conditioner Breaker (Line 2)

#### 8.3.4.1 Air Conditioner Breaker

The optional air conditioning system will provide the desired environmental conditions during hotter periods. The compressor unit is located in the main salon and accessed through the port forward dinette seat lid. (Fig. 8.16). The remote panel for environment controls is the main cabin and located on the port entertainment cabinet (Fig. 8.17).

The air conditioning system is powered by the AC system and is controlled by a 25 amp toggle switch breaker

labeled “AIR CONDITIONER”.



Figure 8.16



Figure 8.17

#### 8.3.4.3 Double Line Shore Power to Air Conditioner

If a single shore power is less than 50 amps, a second shore power line is required to run the air conditioning. To power the air conditioning, complete the following:

1. Connect 2 shore power lines to the shore power

## AC Electric Systems

inlets and turn shore power on (see Connect and Turn on Shore Power above).

2. Switch on line 1 AC Main toggle switch breaker on the AC panel.
3. Switch on line 2 AC Main toggle switch breaker on the AC Panel.
4. Switch on the "AIR CONDITIONER" toggle switch breaker at the AC Panel.

### 8.3.4.4 Single Line Shore Power to Air Conditioner

If a single shore power is 50 amps, that line is sufficient to power both the optional air conditioner and the standard AC system. To power the air conditioning, complete the following:

1. Connect 1 shore power line to a parallel shore power yoke cord.
2. Connect both ends of the shore power yoke cord to the shore power inlets and turn shore power on (see Connect and Turn on Shore Power above).
3. Switch on line 1 "AC MAIN" toggle switch breaker on the AC panel.
4. Switch on the "PARALLEL" toggle switch breaker on the AC panel. (The toggle switch is managed by a slide-bar stopper. This stopper will only allow source power to be paralleled from either 1 shore power line with 50 amps or from the generator.)
5. Switch on the "AIR CONDITIONER" toggle switch breaker at the AC Panel.

### 8.3.4.5 Generator Power to Air Conditioner

The generator has sufficient resources to power the AC system, including the air conditioner. To power the air conditioning, complete the following:

1. Execute the generator start sequence discussed previous.
2. Switch on the "GENERATOR" toggle switch breaker on the AC panel. (The toggle switch is managed by a slide-bar stopper. This stopper will only allow source power to be from shore power or the generator).
3. Switch on the "PARALLEL" toggle switch breaker on the AC panel. (The toggle switch is managed by a slide-bar stopper. This stopper will only allow source

power to be paralleled from either 1 shore power line with 50 amps or from the generator.)

4. Switch on the "AIR CONDITIONER" toggle switch breaker at the AC Panel.

*NOTE: When using the air conditioning systems with other appliances power up the air conditioner first.*

*NOTE: Consult the air conditioner manufacturers' OEM manual for air conditioner operation, care and maintenance.*



**Always make certain that the pick-up and discharge valves for the Air Conditioning System are opened before using. Failure to do so will cause permanent damage to your compressor. Also, be certain that the strainer is clean. See the Water Systems section for details on cleaning the Strainers.**

### 8.3.4.6 Air Conditioning System Operation

Once power is sourced to the air conditioning, one simply turns on the unit at the air conditioner remote panel and sets the temperature (see Fig. 8.20 for details on ducting and venting). Refer to the Water System chapter in this manual and the manufacturer's OEM manual for more detailed information regarding its operation.

*Important: Be sure to close the air conditioner seacock when the air conditioner is not in use.*

### 8.3.6 Spare Breaker Positions

The AC Panel has spare toggle switch breaker positions available for the protection and control of future added components.

## AC Electric Systems

Troubleshooting		
Problem	Possible Cause	Solution
No AC power	Shore power breaker(s) tripped or off Shore power cord not connected Loose or disconnected wire	Turn breaker on or reset Check cord, plug in if necessary Tighten connections. See your dealer
No power to AC devices	Breaker(s) at AC Panel tripped or off Shore power cord not connected Loose or disconnected wire	Turn breaker on or reset Check cord. Plug in if necessary Tighten connections. See your dealer
Inadequate power to AC devices	Electrical demand greater than output	Switch off devices and equipment not needed Use shore power AC line if available
Continuous tripping of "AC Main" breaker	Cause of problem not corrected	Determine cause and correct problem before resetting breaker; see your dealer if problem persists
No power at AC outlets	"Outlet" breaker on the AC Panel is OFF Ground fault interrupter tripped	Switch breaker to ON Reset button on outlet and test

## AC SYSTEM MAJOR COMPONENT GENERAL LAYOUT WITH INVERTER

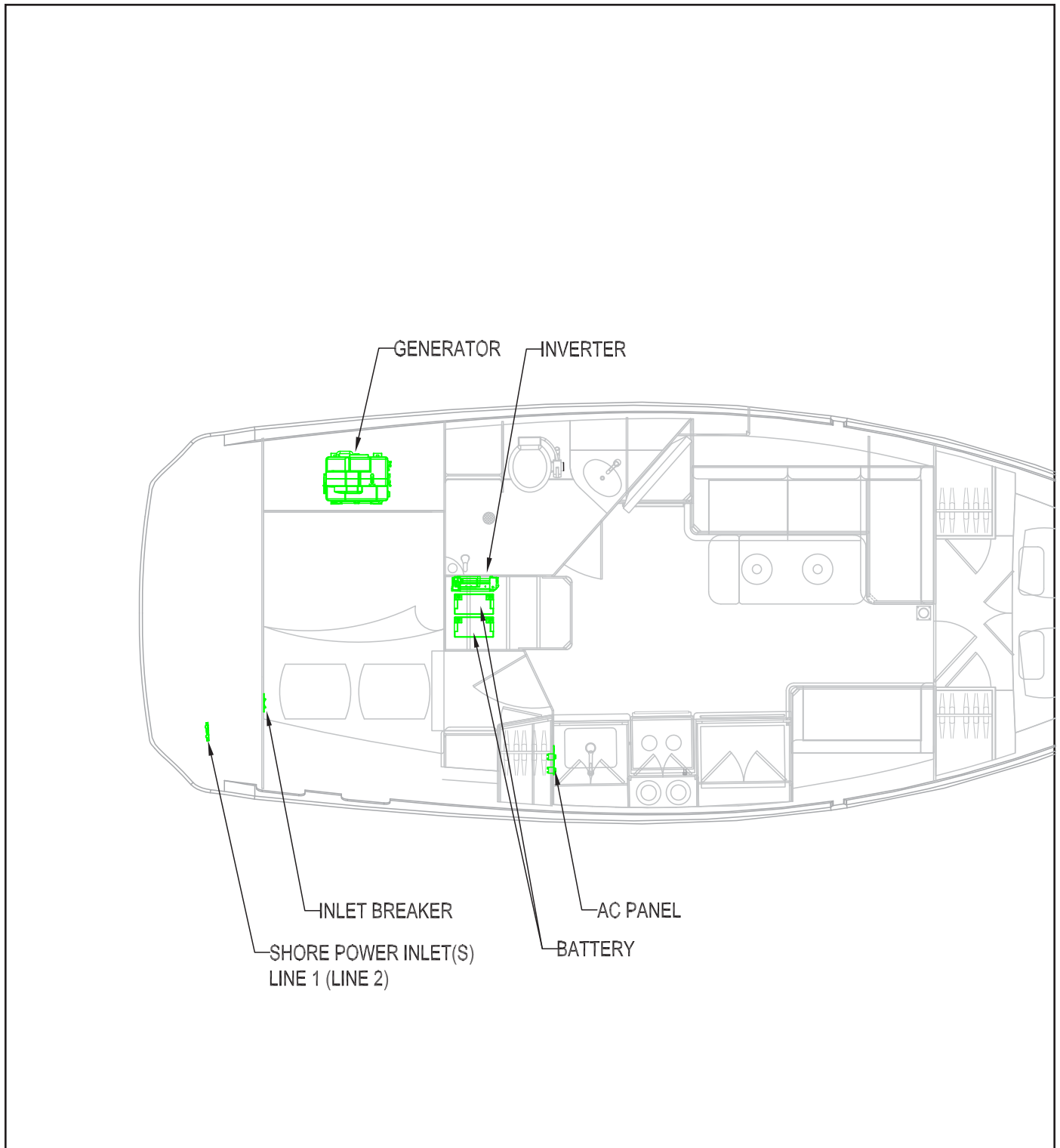


Figure 8.18

## AC OUTLET LAYOUT

**⚠ DANGER ⚠**

Never work on an energized circuit.  
Always treat any circuit as if it were live!

Electricity cannot be detected without specialized test equipment. Never think you know whether a circuit is "live", always have qualified, competent professionals inspect or make repairs to your electrical systems.

Always run the blowers for at least four minutes before starting any engines.

Internal combustion engines produce carbon monoxide, a dangerous, poisonous gas. Be sure and read the boating safety chapter concerning Carbon Monoxide before starting any engines.

Alterations or extensions to the electrical system can cause electrical shock or fire. Only trained, competent, and certified electricians should perform any electrical maintenance, work, or changes to your boat's electrical system.

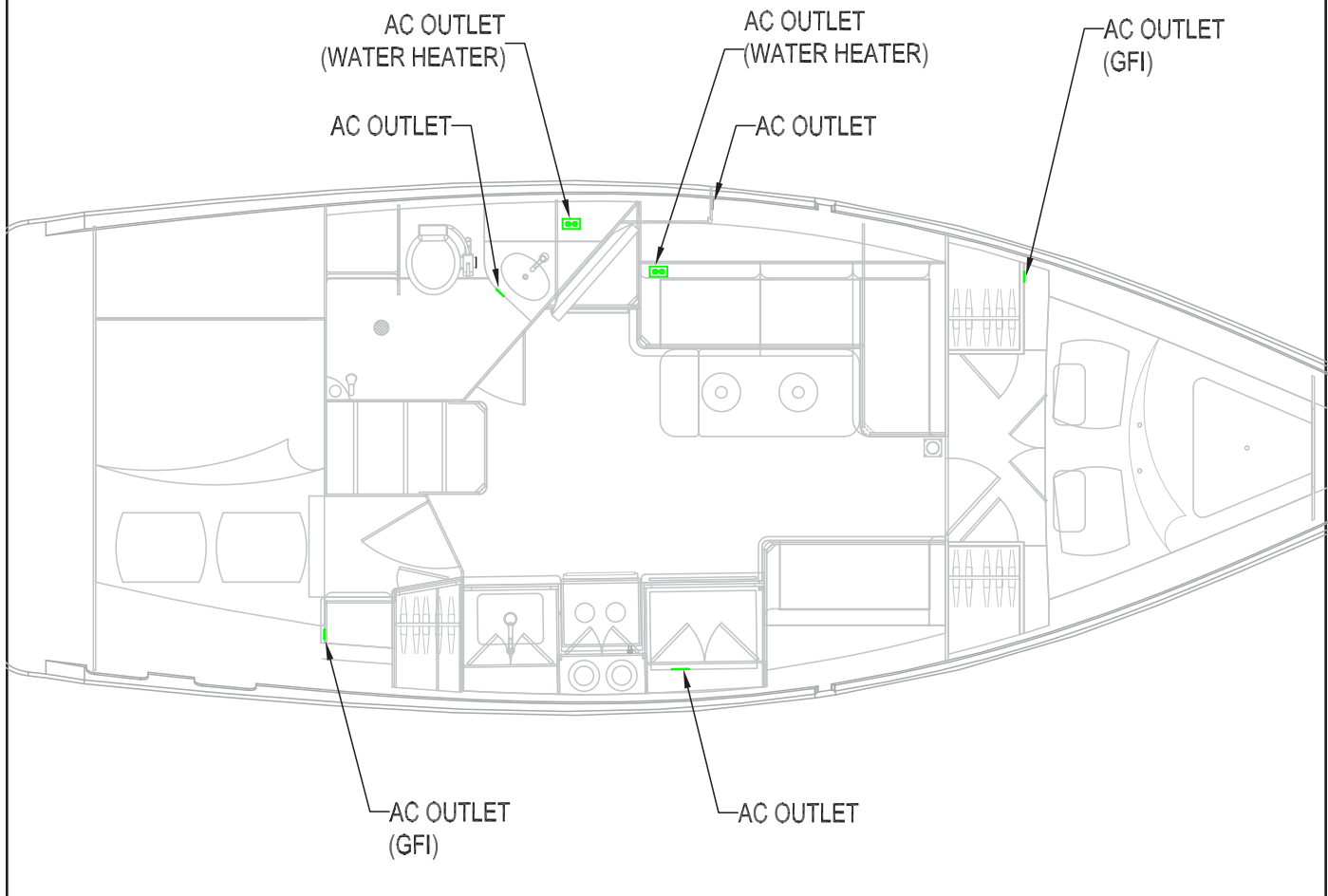


Figure 8.19



## AIR CONDITIONER DUCTING LAYOUT

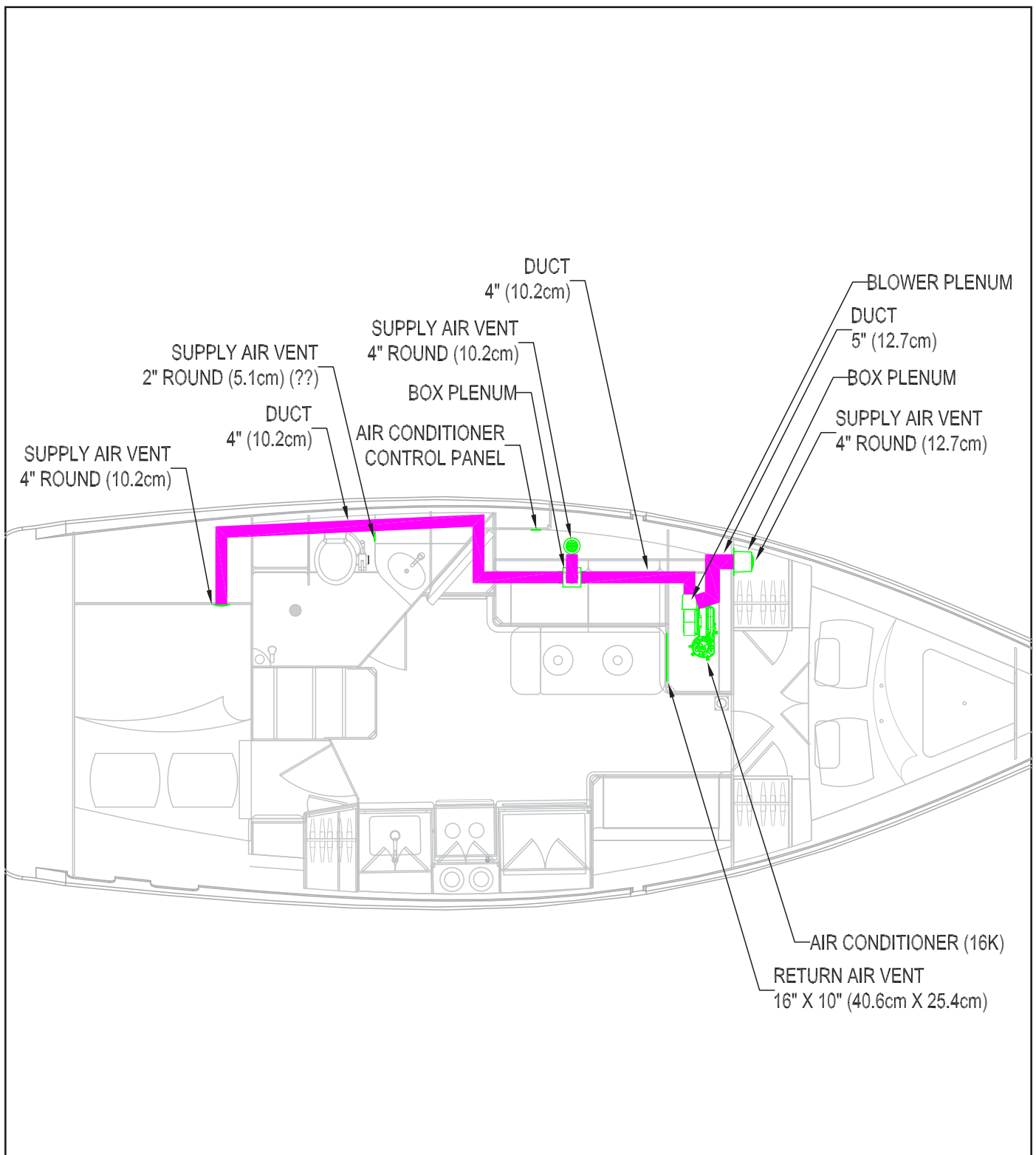


Figure 8.20

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings present.





MARLOW-HUNTER, LLC

*Chapter 9*

# *Water Systems*

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## Water Systems

The fresh and raw water systems discussions will consist of the following categories:

1. Fresh Water Tanks and Fills
2. Pumps
3. Pick-ups, Valves and Strainers
4. Water Heater

Please refer to Figure 9.18 for the overall fresh water system layout.

### 9.1 Fresh Water Tanks and Fills

The fresh water system on your boat features a tank with a 50 US gallon (189L) capacity. The tank is filled at the water fill fitting (Fig. 9.1) located on the port foward deck near the anchor locker. The tank assembly incorporates a vent fitting (see the Waste chapter in this manual for details on venting) to allow the tank to “breathe”. It is a thru-hull fitting located on the port forward hull (see Boating Safety and Underwater Gear chapters of this manual for the deck hardware and thru-deck location diagrams).

The fresh water tank is located in the v-berth bunk and can be accessed through the forward bunk drop-in (see Fig. 9.2 showing tank placement during manufacturing).



Figure 9.1

#### 9.1.1 To fill the fresh water tanks

1. Ensure the potable water supply is suitable for drinking. Not all potable water is drinking water. Check with the dock master if necessary.
2. Open a water tank fill fitting (Fig. 9.1).
3. Using the hose from the potable water supply, fill the tank until water starts flowing through the vent.

4. Close the fill fitting.
5. Repeat steps 2-4 for the second tank.

### **! WARNING !**

**Before connecting to a dock side water source, make certain the water is suitable for drinking. Water that may be of questionable quality could result in serious illness or death.**



Figure 9.2

### **! CAUTION !**

**Always ensure when filling the fresh water tanks you are filling it through the fresh water fills. Other fill fittings or pump-outs are visually similar. Filling fresh water into the waste pump out could flood your boat, or filling the diesel fuel tank could damage your fuel system.**

#### 9.1.2 Fresh Water Sanitation

*NOTE: Please be sure and read the OEM manuals supplied with your boat. The next section is quoted from one of those manuals.*

“Sanitizing Potable water systems require periodic maintenance to deliver a consistent flow of fresh water. Depending on use and the environment the system is subjected to, sanitizing is recommended prior to storing and before using the water system after a period of storage. Systems with new components, or ones that have been subjected to contamination, should also be disinfected as follows:

*NOTE: This sanitizing procedure is in conformance with the approved procedures of the US Public Health Service.*

1. Use the following methods to determine the amount of common household bleach needed to sanitize the tank:

## Water Systems

- a. Multiply “gallons of tank capacity” by 0.13; the result is the ounces of bleach needed to sanitize the tank (30 gallons X .13 = 3.9 oz bleach).
  - b. Use the number of liters of tank capacity to determine the number of milliliters of bleach needed to sanitize the tank (120 liters of tank capacity = 120 milliliters of bleach).
2. Mix into solution the proper amount of bleach within a container of water
  3. Pour the solution (water/bleach) into the tank and fill the tank with potable water.
  4. Open all faucets (hot and cold) allowing the water to run until the distinct odor of chlorine is detected.
  5. The standard solution must have four (4) hours of contact time to disinfect completely. Doubling the solution concentration allows for contact time of one (1) hour.
  6. When the contact time is completed, drain the tank. Refill with potable water and purge the plumbing of all sanitizing solution.”



Figure 9.3

## 9.2 Pumps

Your boat will have both fresh water and raw water pumps which control the flow of water to the related components. These are electrically powered pumps.

### 9.2.1 Fresh Water Pump

The fresh water pump supplies pressurized water to the system. The pump is located within the port aft settee storage compartment (Fig. 9.3).

The fresh water pump breaker switch is located on the DC panel (refer to the DC Electric System chapter in this manual for switch breaker details). When the breaker is switched on, the pump will run until the hot and cold water system is pressurized. An automatic pressure switch shuts the pump off until the pressure drops to a preset level (for example, a pressure drop caused by opening a faucet). The pump will then run again until the system is pressurized and turn itself off. The pump has a built-in check valve to prevent backflow through the pumps.

In addition to the standard access to fresh water through the head and galley, your boat features an optional cockpit shower/deck-washdown unit located on the left side of the starboard transom garage (Fig. 9.4).

**NOTE:** Operate the fresh water pump only when there is water in the tank. Running the pump dry will damage the diaphragm.

**NOTE:** If the pump runs from time to time even though no water is being used, a water leak most likely exists.. Check all lines for leaks and repair immediately.

**NOTE:** Whenever servicing the fresh water pump, shut off the water pump breaker at the DC panel.

## Water Systems



Figure 9.4

### 9.2.2 Air Conditioning Seawater Pump

The optional air conditioning unit will require a water pump to supply raw water to cool the compressor. The pump (Fig. 9.5) is located in the main salon with access through the starboard floor panel.

Refer to Figure 9.15 for the full air conditioning water supply layout.

#### 9.2.2.1 To Operate the Air Conditioner

Refer to the AC Electric System chapter in this manual for a discussion on the electrical controls of this system.

*NOTE: Consult the pump manufacturer's OEM manual for further details regarding operation, care and maintenance.*



Figure 9.5

### 9.2.3 Engine Seawater Pump

The engine requires a water pump to supply raw water to cool the motor. This pump is not a separately installed component but is part of the engine assembly. Refer to the engine manufacturer's OEM manual for information

on pump operations.

## 9.3 Pickups, Valves and Strainers

Your boat uses water pickups, valves and strainers to supply water to the boat's various systems.

### 9.3.1 Pick-ups

Pick-ups, or thru hulls, are placed in various locations in the hull of your boat (refer to the Underwater Gear chapter in this manual for details on thru-hull locations). The pickups will incorporate a "Y" or ball type intake valve (also referred to as a seacock) which controls the flow of raw sea water to the specific component or system associated with the pick-up.

Figure 9.6 shows the intake, ball valve and strainer associated with the optional air conditioning system. To close the ball valve, rotate the handle to the straight up position. To open the valve to seawater, rotate the valve fully clockwise.



Figure 9.6

## ! CAUTION !

It is very important to ensure the intake valve is open before using a raw water supplied system. Failure to do so could damage or break down the system or component.

### 9.3.2 Strainers



Your boat is equipped with strainers (Fig. 9.7 and 9.8) that strain the raw water taken in the pickups, or thru-hulls, for objects that could damage the impeller or pump equipment. They are equipped with a screen or filter that collect these objects. They must be cleaned as part of routine maintenance.

To clean a strainer:

1. Ensure the intake valve is in the off or closed position. Failure to close the intake valve could result in a flooded boat.
2. Remove the “collector” or glass encasement that houses the screen.
3. Remove any objects collected inside and wash the screen.
4. If an ‘o’ ring is present in the seal on the cap, check it for wear or leakage and replace if needed (contact your dealer for replacement).
5. Return the screen and glass encasement.



Figure 9.7



Figure 9.8

### 9.3.3 Engine Pickups and Strainers

For your engine to remain at a specific temperature when operating, it will need the assistance of raw water. Heat from the closed cooling system on the engines is transferred to the cooler seawater through heat exchangers inside the engine. The raw water is then discharged through the exhaust.

With a saildrive configuration, the seawater pickup is incorporated within the sail drive leg and screened internally. Please refer the engine manufacturer's OEM manual for details on the pickup and strainer. Water then flows through a second external strainer before passing into the engine assembly (Fig. 9.9).

### ! CAUTION !

**Before using any system that requires raw cooling water, ensure that the intake valve is opened and the strainers are not clogged.**

### ! WARNING !

**Hot coolant under pressure may boil or explode causing burns or other personal injury when the pressure cap is removed. Allow the engine to cool, then open the cap slowly to allow any pressure to vent before completely removing the cap.**



Figure 9.9

### 9.3.4 Fresh Water Pump Strainer

The strainer (Fig. 9.8) for the fresh water pump is mounted directly to the pump as noted in Fig. 9.3.

### 9.3.5 Air Conditioning Pickup and Strainer

As mentioned previously, the optional air conditioning system requires raw water to cool the compressor. Please refer to Figure 9.15 for the raw water system layout for the air conditioning system.

The pickup and strainer (Fig. 9.6) are located in the companionway landing and accessed through the floor panel in the landing area (refer to the Underwater Gear chapter of this manual for specific thru-hull locations).

*NOTE: Consult the air conditioner manufacturer's OEM manual for further details regarding operation, care and maintenance.*

### ⚠ CAUTION ⚠

**Always ensure engine and air conditioner intake valves, or seacocks, are open before using these components. Failure to do so could overheat and cause them significant damage.**

### 9.3.6 Toilet Water Supply

The manual toilet uses raw water for flushing. The optional electric toilet uses fresh water from the fresh water system (salt water can damage the electric head components). Please refer to Figure 9.17 for the raw water layout for the manual toilet.

For further information on the head system, please refer to the Waste Systems chapter in this manual.

## 9.4 Water Heater

The fresh water pump supplies water from the water tank to the water heater (and cold water lines). The water heater is located in the main salon port aft settee and accessed through the storage compartment lid (Fig. 9.10).

The water heater breaker switch is on the AC panel. When the breaker is turned ON, the water heater will heat water until the established temperature level is reached. Before switching the breaker ON, ensure the fresh water pump breaker switch on the DC panel is also ON and the system is pressurized.



Figure 9.10

Follow these procedures when using the water heater:

1. Make sure the water heater is full of water. Open a hot water faucet and allow a steady stream of water to flow out of the faucet to remove all air from the hot water system.
2. With shore power connected to your boat, or the optional generator running, switch on the water heater circuit breaker.
3. Wait for the water in the tank to heat up, then use as you would at home.

### ⚠ WARNING ⚠

#### **IMPORTANT!**

**Water temperatures in excess 110°F (43°C) are dangerous and may cause scalding, severe injury or death**

### 9.4.1 Water Heater Temperature Adjustment (Thermostatic Mixing Valve)

1. Let the water flow for at least 2 minutes to allow supply temperature to stabilize.
2. Calibrate the mixed water outlet temperature by placing a thermometer in the mixed water stream.
3. To adjust the setting of the valve, loosen locking cap with hex wrench (Fig. 9.17). Cap must be lifted 1/4" to adjust temperature.
4. To increase the temperature, turn counterclockwise. To decrease temperature, turn clockwise.
5. Lower handle and tighten screw.
6. Check outlet temperature (compare to the scalding temperature reference table listed below).

*NOTE: Consult the water heater manufacturer's OEM manual for further details regarding operation, care and maintenance.*

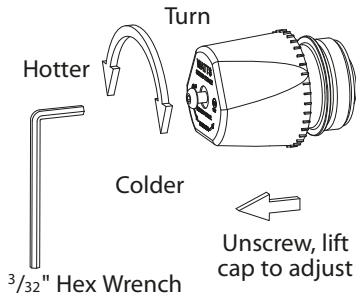


Figure 9.13

## Hot Water Scald Time (Reference Only) Temperature/Max duration until injury

155F (68.3C)	1 second
145F (62.9C)	3 seconds
135F (57.2C)	10 seconds
130F (54.4C)	30 seconds
125F (51.6C)	2 minutes
120F (48.8C)	5 minutes

## ⚠ WARNING ⚠

Allowing your boat to stay connected to dockside water supply while unattended could result in a sunken boat. A major leak or break in the system could flood the bilges. Excess water in the bilges could flood the batteries and result in your boat sinking.

### 9.4.2 Heat Exchanger

An additional feature of the water heater is its heat exchanger component. This feature allows the water heater to perform its job by transferring heat from the engine's coolant to the fresh water system. Hoses run from the engine to the water heater and back to form a closed loop. This functionality produces a supply of hot water without the use of shore power.

Refer to Figure 9.17 for the heat exchanger plumbing layout.

## ⚠ WARNING ⚠

Hydrogen gas may form in water heater if not used. Open valves. Do not smoke or use electrical appliances for several minutes before use.

## ⚠ CAUTION ⚠

Ensure the water heater is full before energizing. Bleed off any air by opening the hot water valve. Close only when there is a steady flow of water. This will bleed the hot water system of air. Failure to follow these instructions could result in damage to the heating elements in your water heater.



## Water Systems

Troubleshooting		
Problem	Cause	Solution
Air in system	Tank empty	Fill water tank
Fresh water pumps cycle on and off	Tank empty Blocked or pinched water lines Loose electrical connections  Defective pumps Leak in system	Refill Clear obstruction or straighten line Check connections. Tighten as needed See your dealer for service Repair leak. See your service dealer for repairs
Low water pressure at all sinks and showers	Defective pump	See your dealer for service
Low water pressure at one sink	Pinched water line	Straighten line
No hot water (AC Power)	Water heater breaker OFF	Switch breaker to ON

## FRESH WATER LAYOUT

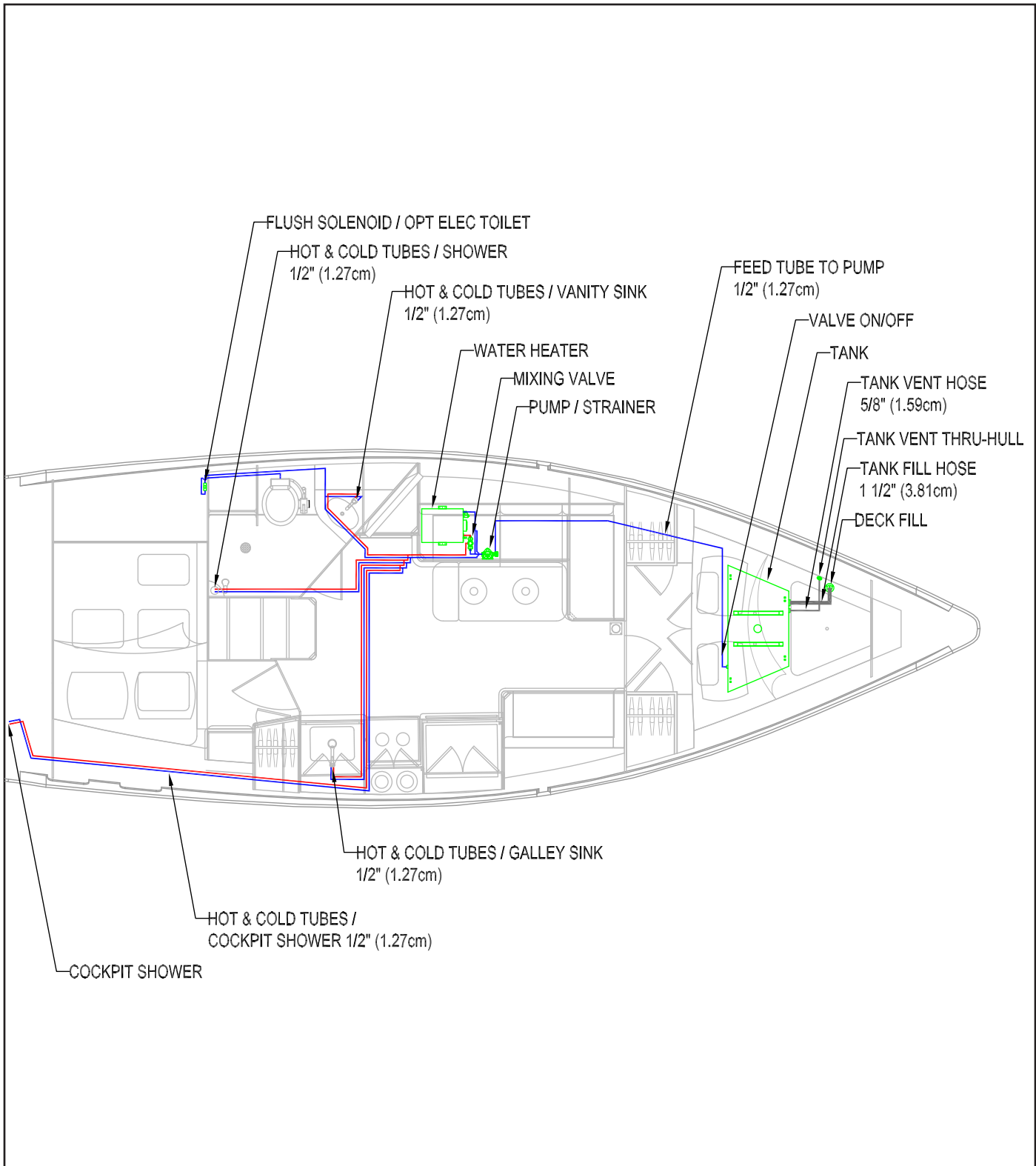


Figure 9.14

## ENGINE (21HP) RAW WATER LAYOUT (SHAFT DRIVE)

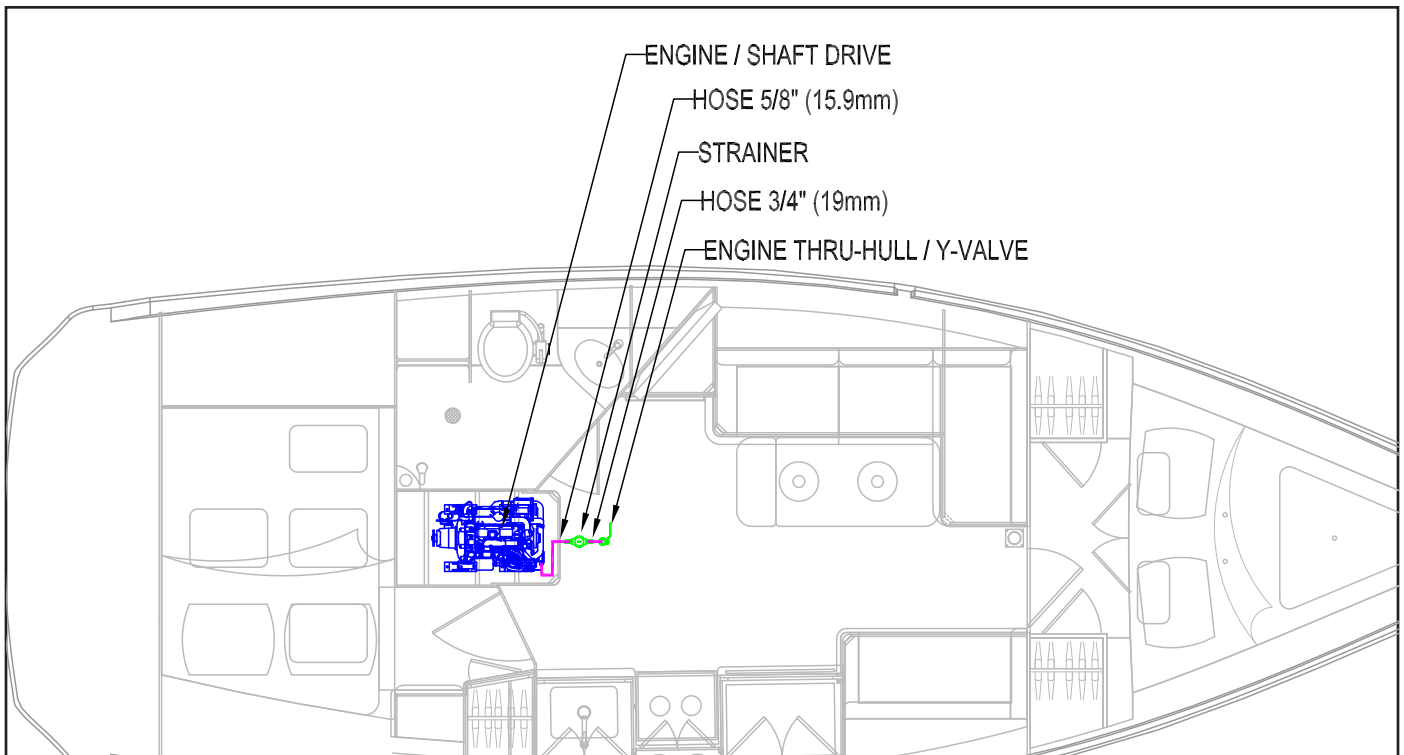


Figure 9.17

## ENGINE (29HP) RAW WATER LAYOUT (OPTIONAL SAIL DRIVE)

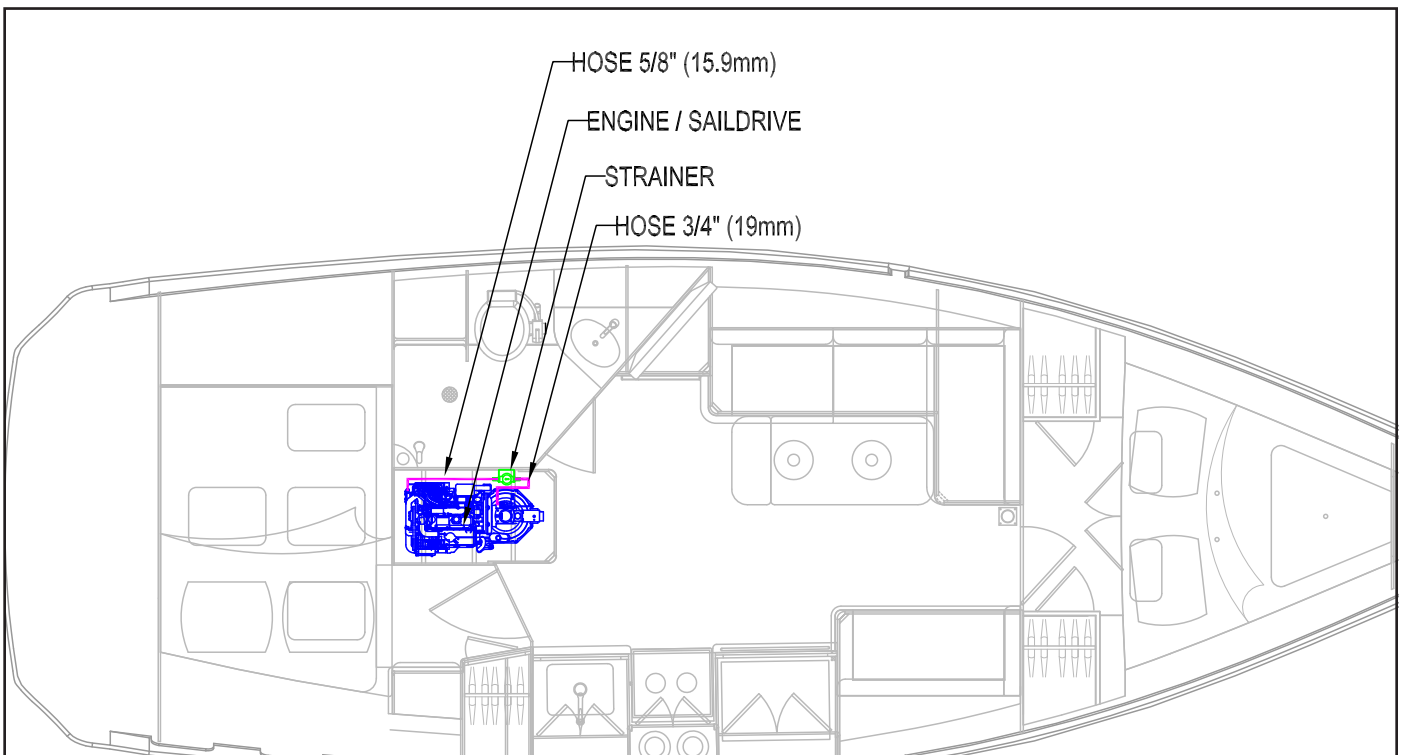


Figure 9.18

STANDARD TOILET AND OPTIONAL AIR CONDITIONING RAW WATER LAYOUT

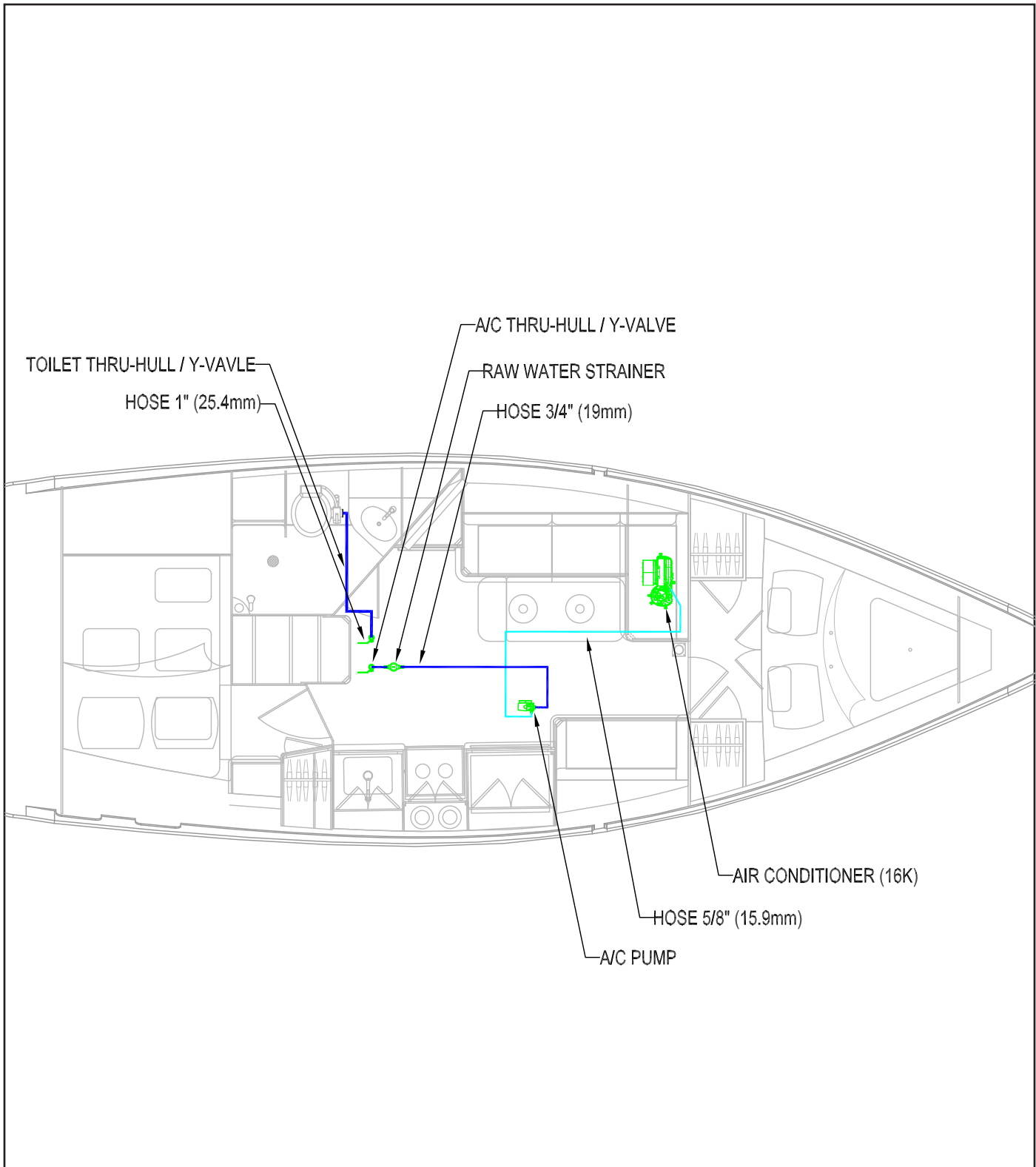


Figure 9.15

## Water Systems

Notes:

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MARLOW-HUNTER, LLC

*Chapter 10*

# *Waste Systems*

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## Waste and Sanitation Systems

Your boat has waste systems designed to fit the most demanding environment and feature the latest innovations in sanitation. These systems process waste based on the following general categories:

- A. Liquid, with subcategories of:
  - 1. Black water - raw sewage
  - 2. Gray water - waste not considered raw sewage
  - 3. Raw water - cooling water that is taken in through pickups, etc. and discharged back
- B. Gaseous - exhaust, tank ventage and ventilation

With these categories in mind, we will discuss the waste and sanitation systems organized into the following components:

- 1. Drains and Discharges
- 2. Pumps
- 3. Engine & Generator Waste
- 4. Head System
- 5. Holding Tank
- 6. Blower

**IMPORTANT:** U.S. Coast Guard regulations require that boats have a sanitation system on board to control pollution. Waste is to be stored in a holding tank or other device so it can be properly disposed of at a shore facility. Discharging this waste overboard in U.S. lakes, rivers, bays, and sounds, and within three miles of shore in international waters is prohibited. Check with the Coast Guard regarding regulations in your area.

### 10.1 Drains and Discharges

Any liquid waste removal system that is gravity fed would be termed a drain. Likewise, any waste removal system incorporating a pump would be termed a discharge. The passage of waste from the boat into the external environment is by thru-hulls or thru-decks. These exchange points are connected by hose or pipe to a collection point or point of waste origin.

#### 10.1.1 Thru Hulls

There has to be an exchange point or outlet to release liquid waste. These outlets are called thru-hulls and are openings in the hull of your boat and generally incorporate bronze or plastic fittings. Thru-hulls can either drain or discharge from a single source, such as a holding

tank or bilge pump, or a common drain fed from multiple sources.

Thru-hulls are typically fitted to drain hoses or pipes and sized to be compatible with the system they drain. Hoses that feed the thru-hulls or common drains are generally looped over the fitting in order to prevent any water or waste from leaking or draining back into your boat. Fig. 10.1 gives you a summary view of some thru-hulls. Please refer to the Underwater Gear chapter in this manual for specific details on thru-hull locations on your boat.



Figure 10.1

Vents, shown second from the left in Fig. 10.1, are another type of thru-hull or thru-deck and represent another method of waste disposal. These thru-hulls are limited to allowing over-flow or air to escape the fuel, holding and water tanks aboard your boat. This is one way that gaseous waste products, and in some instances liquids, are properly disposed. However, avoid using the fuel tank vent as a method to determine if your tanks are full when fueling. Fuel spills are a dangerous hazard (see the Fuel System chapter in this manual for additional information). Please refer to the Underwater Gear chapter in this manual for specific details on vent locations on your boat.

#### 10.1.2 Overboard Discharge

Some discharges have valves associated with them. The black water, or raw sewage system from the head, is one such system (although technically this system is a drain, it is generally discussed as a discharge). This ball valve or Y-valve is the overboard discharge valve which allows the discharge of the solid waste from the holding tank when at sea (discussed in greater detail within the Holding Tank section).

**NOTE:** The black water overboard discharge valve should remain closed at all times except during a purposeful discharge in lawful waters.

### 10.2 Pumps

## Waste and Sanitation Systems

Basically, all pumps are in some way associated with the waste/sanitation system, but this section will only focus on pumps that are directly associated with the process of pumping waste overboard. The supply function of these pumps are discussed in other sections.

Please refer to Figure 10.17 for the bilge/sump pump and drain layouts as reference to the subsequent discussions. Please reference the DC Electric System chapter of this manual for details regarding control and circuit protection of the waste related pumps.

### 10.2.1 Bilge Pump

The safety of those on board your boat is a primary objective. Therefore, we strongly encourage you review all information contained in this manual, as well as the manufacturer's OEM manuals concerning all systems on your boat. Specifically, the bilge pump system will be one that is crucial to fully understand. These pumps have the critical function of removing water from the bilges of your boat. They must be kept clean and functional to ensure they complete their task.

The main bilge pump (Fig. 10.2) is installed in the main salon and accessed through the main bilge floor panel. It is rated at 12 1/2 GPM pumping capacity and is the first responder in the event of water collection.

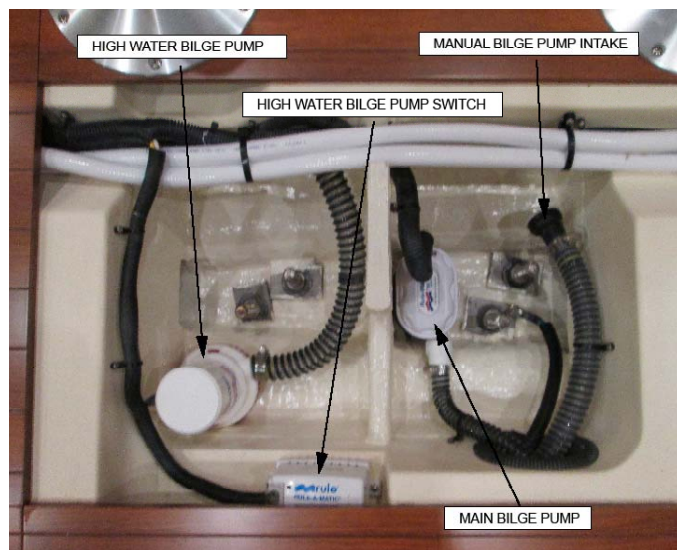


Figure 10.2

#### 10.2.1.1 Main Bilge Pump Operations

The main bilge pump is a “smart” pump; its electronic

sensor activates the pump when water is present. In addition, the pump can be manually activated by flipping and holding the toggle switch on the DC panel to the right until the pump out is complete. The toggle will spring back upon release. (See the DC Electric chapter in this manual for additional details on switch controls.) The pump will discharge waste through a starboard thru-hull.

**NOTE:** Power to the DC panel is not required in order to manually operate your bilge pumps.

#### 10.2.1.2 Maintenance on Bilge Pump

No maintenance is required beyond ensuring that the float switches are operational and pump intakes are debris free.

#### 10.2.2 Emergency High Water Alarm

The high water alarm will sound if your boat is taking on water sufficient to overwhelm the ability of the main bilge pump to properly discharge. Should the water level rise above the high water mark, you will hear the high water alarm sounding from the Safety Panel, located on the forward starboard cockpit, together with a solid red light displayed (Fig. 10.3). This alarm means high water exists in the bilges and it is time to take action.

For reference on possible courses of action, we recommend reading (prior to your initial launch) Chapman's Piloting, Seamanship and Boat Handling for recommendations on responding to a high water situation. If you do not have a copy of this book, we strongly encourage purchasing a copy and keeping it handy; it is full of useful safety and navigational information.

The high water mark is determined by the placement of the high water float switch (Fig. 10.2) located in the main bilge and accessed through the forward center floor panel in the main cabin.

The alarm system can be periodically tested using the push button switch located on the Fuel/Safety Panel. Pressing the TEST button will activate the audible alarm and light display to verify proper operation. Release the button to end the test.



Figure 10.3

### 10.2.3 High Water Bilge Pump

The optional high water bilge pump is a redundant system for additional protection on water accumulation within the boat. As noted above, if a high water condition exists and the optional high water bilge pump is installed (Fig. 10.2), the pump will be activated in conjunction with the alarm.

It is located in the main bilge and accessed through the forward center floor panel in the main cabin. It has a pumping capacity of 66 GPM and functions to remove water from the bilges in the event the main bilge pump is overwhelmed or becomes inoperable. The pump will discharge waste through a starboard thru-hull.

### 10.2.3 Manual Bilge Pump

The manual bilge pump (Fig. 10.4), located in the port forward cockpit, is also a redundant system for additional protection. The pump includes a manual handle to be inserted into the pump mechanism where the up and down motion on the handle will begin discharging water out the thru-hull mounted on the port sidewall of the steering cavity. Pumping capacity will depend on the speed of the pump action. The actual pump can be accessed through the port seat lid. The manual handle is stored on the underside of the port seat lid. The receiver for the manual handle is mounted to the port cockpit seat face (includes a flip-down cover) (Fig. 10.5). The hose intake is located in the main bilge (Fig. 10.2)



Figure 10.4



Figure 10.5

### 10.2.4 Grey Water Collection Box/Pump System

The collection box/pump system (Fig. 10.6) serves to automatically discharge grey water originating from the vanity sink, shower and condensation from the optional air conditioning system which all drain into the collection box. The unit is located in the main cabin and is accessed through the center aft floor panel.

No maintenance is required on the pump itself. However, the system includes a filter to collect larger waste materials. Periodically service the filter by removing the lid for access. Remove the filter and clean. Replace the filter and lid when done.



## Waste and Sanitation Systems

The collection box/pump's electrical system incorporates a reset breaker on the main DC Panel (see the DC Electric System chapter in this manual).

*NOTE: Consult the pump manufacturers' OEM manuals for additional details regarding operation, care and maintenance.*



Figure 10.7

### 10.3 Engine Waste

Raw water used in engine cooling is eventually mixed with the exhaust and discharged through the exhaust system. Please note that the exhaust is a gas, carbon monoxide, and is very dangerous. Please ensure a thorough review of the Boating Safety chapter in this manual and follow all guidelines concerning this potentially lethal gas.

The engine exhaust is channeled to the mixing elbow (Fig. 10.8), located in the engine compartment companionway cover, where water and exhaust gases are mixed together. The mixture then flows (large black hose) to the muffler (Fig. 10.9), located within the aft bunk, and exits the boat on the port transom below the waterline (see the Underwater Gear chapter in this manual for thru-hull locations).

Please refer to Figure 10.18 for the standard engine exhaust system layout and Figure 10.19 for the optional saildrive engine layout.



Figure 10.8



Figure 10.9

### 10.4 Head System

All vessels with fixed toilets operating on the waterways of the United States and some foreign countries are required to be equipped with an operable Marine Sanitation Device (MSD). The marine sanitation system aboard your boat is a waste tank system defined by the United States Coast Guard as a Type III System. Type III systems permit operation of the toilet without direct discharge of untreated waste after every flush. Type III systems can be discharged at a marina, dock side pump-out stations or, if in coastal waters, at least three miles offshore. Please refer to Fig. 10.20 for the black water plumbing layout.

*NOTE: Overboard discharge capabilities must remain inoperative while within the 3 mile limit. Overboard discharge valve*

*must remain closed.*

### 10.4.1 Manual Head System

The manual head system (Fig. 10.10) is designed to use raw water. This marine toilet comes with a compact white vitreous china bowl and is equipped with a hand pump. (refer to the Water Systems chapter in this manual for details on raw water supply for the manual toilet).

### 10.4.2 Electric Head System

The optional electric head (see Fig. 10.11) is designed to use fresh water. The 12 volt electric marine toilet comes with a compact white vitreous china bowl and is equipped with a dual function pump which eliminates the need for hand pumps and dry bowl valves. With the push of a single switch, the self-priming flush pump rinses the bowl. The switch is located on the lower vanity cabinet face.



Figure 10.11



Figure 10.10

The electrical toilet's electrical system incorporates a reset breaker on the main DC Panel (see the DC Electric System chapter in this manual).

### **CAUTION**

**Do not use chlorine-based or caustic cleaning agents, or chemicals such as a drain opening product in your head systems. Use of these products may cause serious damage to the system's seals and hoses.**

*NOTE: Consult the toilet manufacturer's OEM manual for additional details regarding operation, care and maintenance.*

## 10.5 Holding Tank

The holding tank on your boat is installed to hold black water waste until you can safely dispose of or pump it overboard. The tank (Fig. 10.12) is installed within the recess between the hull and the cockpit area of the deck and can be accessed through the port cockpit seat lid.



Figure 10.12

## Waste and Sanitation Systems

**IMPORTANT:** You must ensure it is legal to empty your holding tank in the waters you occupy. Some areas have restrictions on pumping out black water waste!

### 10.5.3 Holding Tank Operations

The holding tank must be emptied when it approaches a full state. There are two methods for removing waste from the holding tank:

1. Overboard discharge when in waters where it is legally permitted
2. Dock side pump-out at a waste facility.

Check with the Coast Guard and local authorities before discharging waste overboard.

#### 10.5.3.1 Overboard Discharge Operation

To discharge the gravity feed holding tank overboard, one simply opens the overboard discharge Y-valve. The valve (Fig. 10.13) is located in the vanity shower and accessed through the lower outboard access panel.



Figure 10.13

To close the Y-valve, rotate the handle counterclockwise. To open the valve to seawater, rotate the valve to the straight up position.

**IMPORTANT:** U.S. Coast Guard regulations require that boats have a sanitation system on board to control pollution. Waste is to be stored in a holding tank or other device so it can be properly disposed of at a shore facility. Discharging this waste

overboard in U.S. lakes, rivers, bays, and sounds and within 3 miles of shore in international waters is prohibited. Check with the Coast Guard regarding regulations in your area.

### **! WARNING !**

Failure to close the overboard discharge valve when not in use could cause the holding tank to fill and possibly flood the boat.

### **! WARNING !**

Waste in the holding tank can form methane gas. Use suitable precautions when any maintenance is conducted to the sanitary system.

#### 10.5.3.2 Dock side Waste Removal

To remove waste from the holding tank at a dock side waste facility, insert the hose from the pump-out facility into the waste access (Fig. 10.14) located on the port aft side-deck and follow any instructions. Instructions may vary from one facility to another.



Figure 10.14

#### 10.5.3.3 Maintenance on Holding Tank

Maintenance on the holding tank simply entails managing odor and ensuring no methane gas leaks exist. Any deodorizer may be used as long as it contains no alcohols or strong chemicals. Do not use strong drain opening chemicals or bleaching agents as they may cause serious damage to the system's seals and hoses.

### 10.6 Blower

To maintain a desired range of temperature and quality of

## Waste and Sanitation Systems

air within the engine compartment, your boat can process a continuous cycle of air with the ventilation system.

A blower (Fig. 10.15) is installed in the aft cabin and can be accessed through the port bunk drop-in (top duct Fig. 10.9). Air is drawn in from the engine compartment and pushed out the air vent located in the starboard transom garage. The blower is activated when the engine start panel (see Engines and Transmissions chapter in this manual) is powered. The blower circuitry is protected by a pop-out breaker located on the DC Panel (see DC Electric Systems chapter in this manual). See Figure 10.20 for the overall blower system layout.



Figure 10.15

### Save Our Seas !

It is illegal to dump plastic trash anywhere into the ocean or navigable waters of the United States. Violation of these requirements may result in civil penalty up to \$25,000, a fine of \$50,000 and imprisonment for up to five years.

<b>PLASTIC -</b> limited to : plastic bags, styrofoam cups and lids, sixpack holders, stirrers, synthetic fishing nets, ropes, lines, and bio or photo degradable plastics. Includes but is not		<b>GARBAGE -</b> Means paper, rags, glass, metal, crockery (generated in living spaces aboard the vessel-what we normally call trash), and all kinds of food, maintenance and cargo-associated waste. "Garbage" does not include fresh fish or fish parts, dishwater and gray water.		<b>DUNNAGE-</b> Material used to block and brace cargo, and is considered a cargo associated waste.		<b>DISHWATER-</b> Means the liquid residue from the manual or automatic washing of dishes and cooking utensils which have been pre-cleaned to the extent that any food particles adhering to them would normally interfere with the operation of automatic dishwashers.	
<b>INSIDE 3 MILES</b>		<b>3 TO 12 MILES</b>		<b>12 TO 25 MILES</b>		<b>12 TO 25 MILES</b>	
(and in U.S. Rivers, Bays and Sounds)		<b>PLASTICS</b>		<b>PLASTICS</b>		<b>PLASTICS</b>	
<b>DUNNAGE, LINING AND PACKING MATERIALS THAT FLOAT</b>		<b>DUNNAGE, LINING AND PACKING MATERIALS THAT FLOAT</b>		<b>DUNNAGE, LINING AND PACKING MATERIALS THAT FLOAT</b>		<b>DUNNAGE, LINING AND PACKING MATERIALS THAT FLOAT</b>	
<b>ANY GARBAGE EXCEPT DISHWATER, GRAYWATER, FRESH FISH PARTS</b>		<b>ANY GARBAGE NOT GROUND TO LESS THAN ONE SQUARE INCH</b>					



## Waste and Sanitation Systems

	<b>Troubleshooting</b>	
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Electric Head Not Flushing	Head breaker Off  Battery Charge Low	Switch Breaker to on. If Breaker is tripped determine cause and correct.  Charge Batteries
Head Not Emptying	Blocked line to tank	Remove material from line
Shower Sump Overflowing	Sump Pump Breaker OFF  Discharge line blocked  Pinched Line  Defective Pump	Switch Breaker to on. If Breaker is tripped determine cause and correct. Clear material from line  Straighten line  Replace Pump (See your dealer for service)
Shower Sump Overflowing	Breaker OFF Discharge line blocked Pinched line Defective float switch Defective pump	Switch breaker to ON. If breaker is tripped, determine cause and correct. Clear material from line Straighten line Replace switch. See your dealer for service Replace pump. See your dealer for service



## BILGE/SUMP PUMP & DRAIN SYSTEM LAYOUT

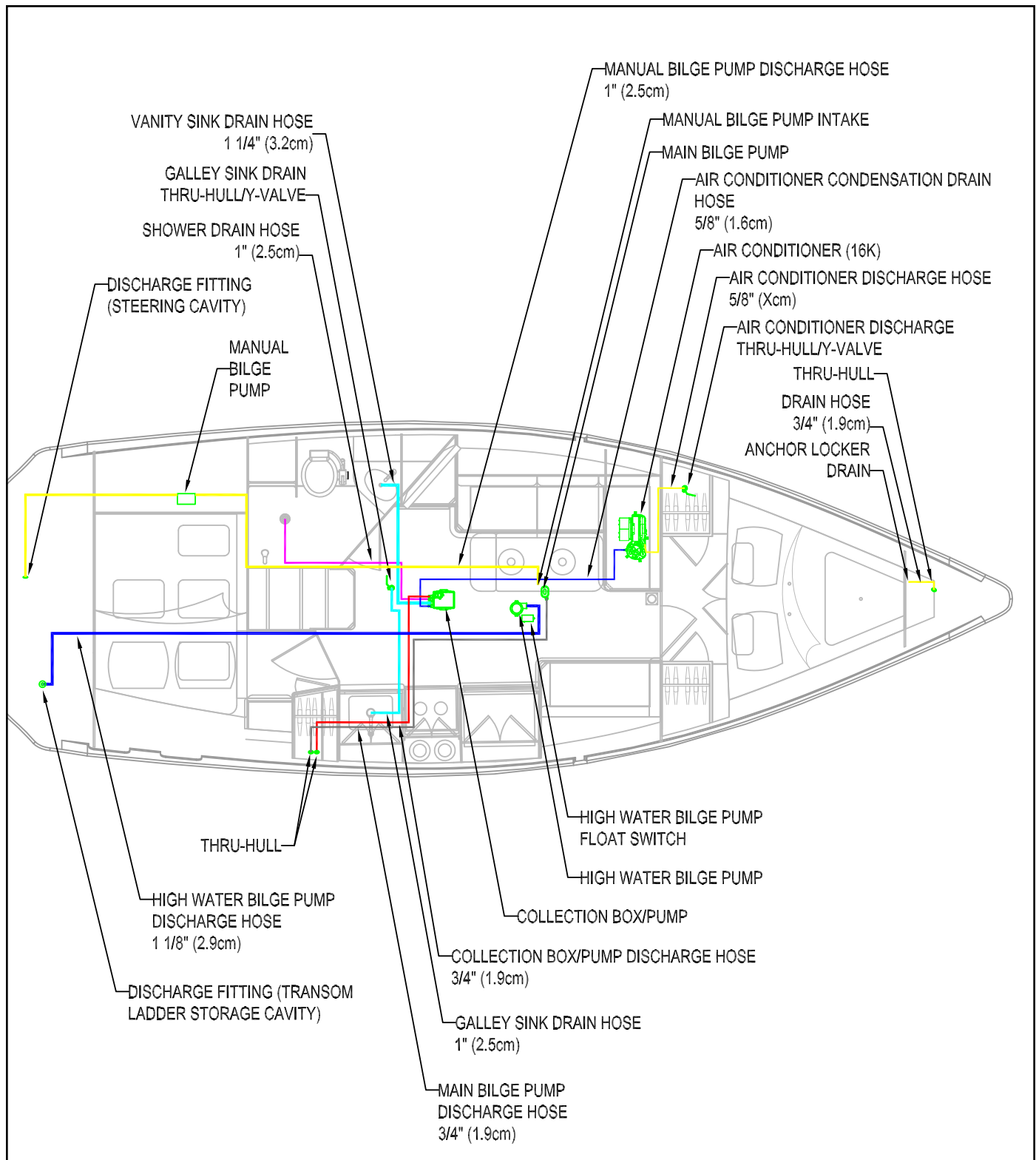


Figure 10.17

## ENGINE (21HP) EXHAUST / RAW WATER HEAT TRANSFER LAYOUT

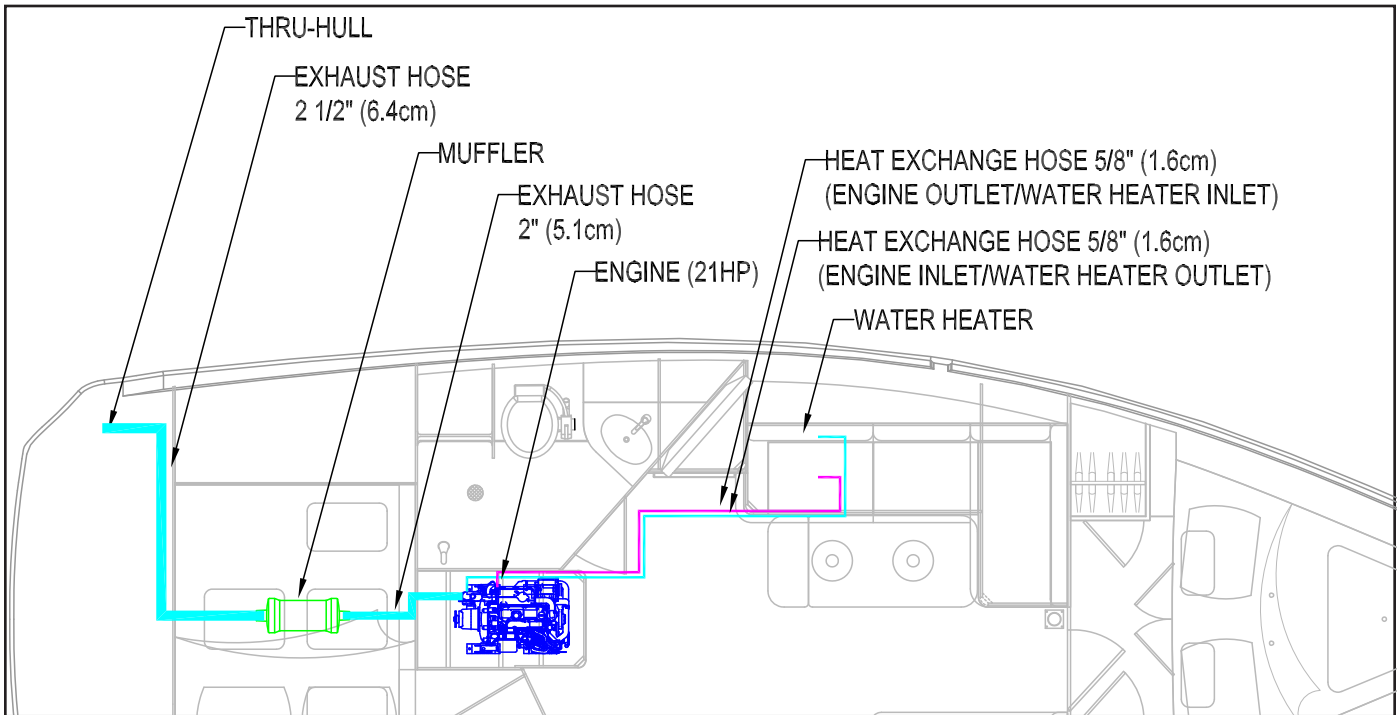


Figure 10.18

## ENGINE (29HP) EXHAUST / RAW WATER HEAT TRANSFER LAYOUT

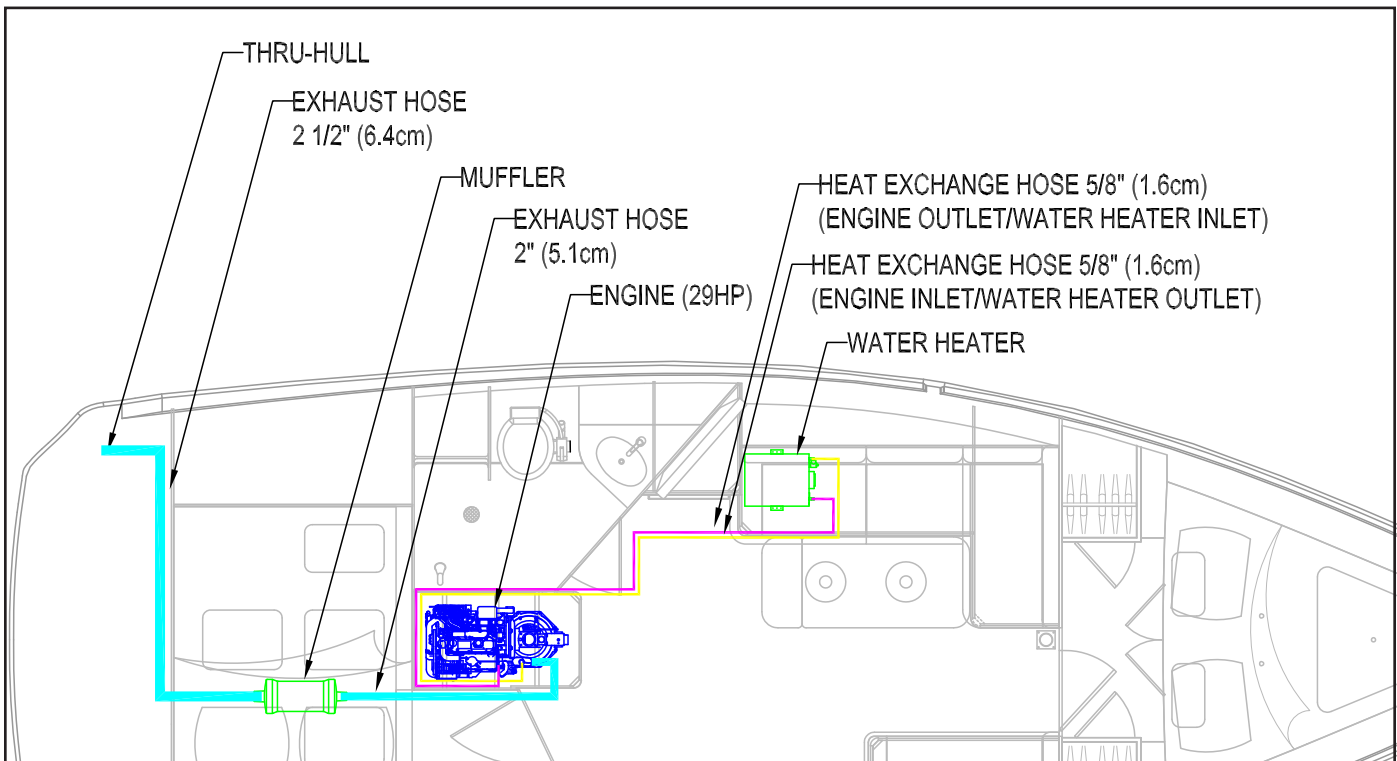


Figure 10.19

## BLACK WATER / ENGINE COMPARTMENT BLOWER LAYOUT

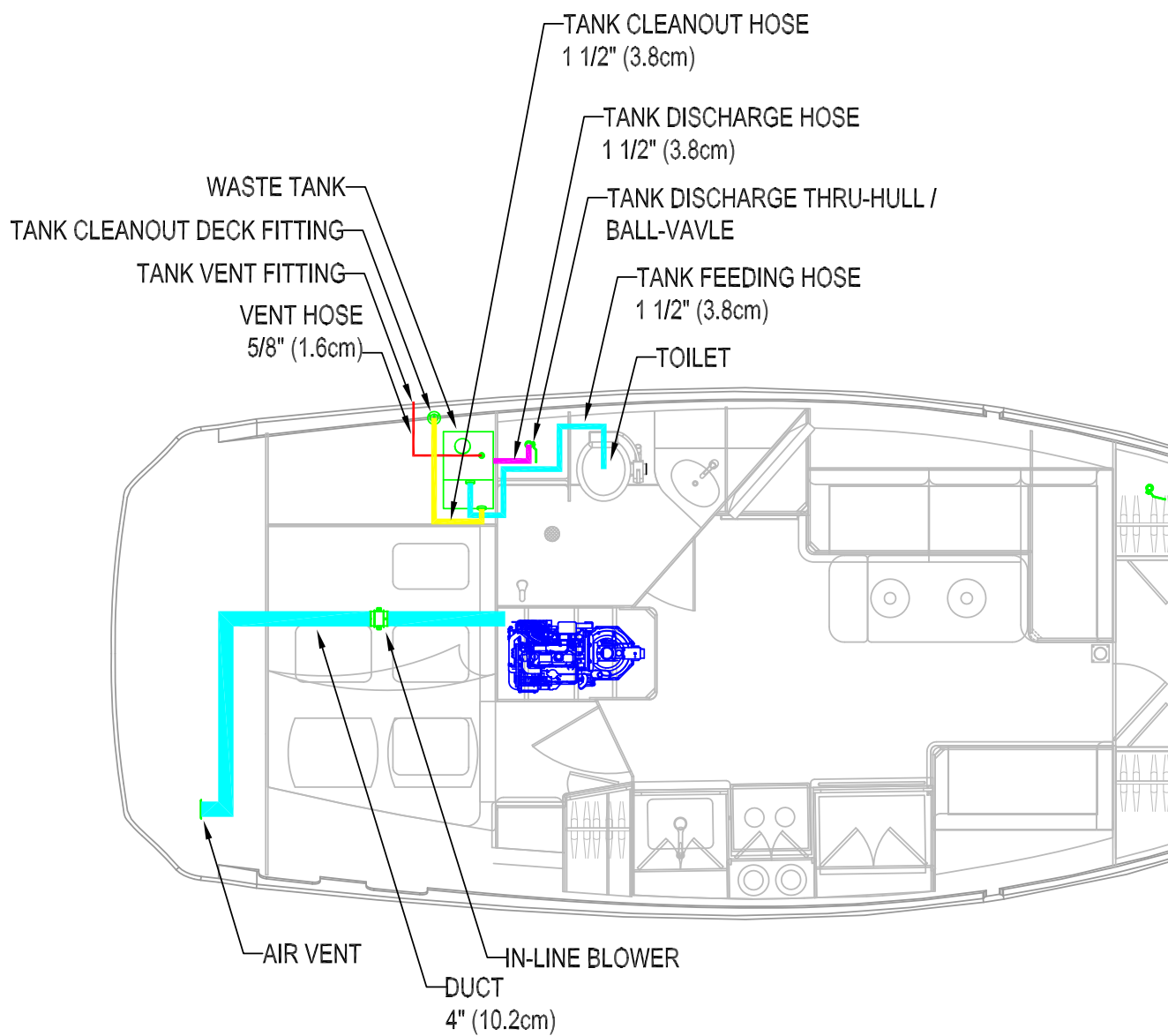


Figure 10.20

This image shows a full page of blank, lined paper. It features approximately 20 evenly spaced horizontal grey lines across its entire width, typical of notebook or composition paper. The background is white, and there are no margins, text, or other markings present.



MARLOW-HUNTER, LLC

*Chapter 11*

***Engines  
and  
Transmissions***

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***MH31***



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This chapter will serve as a general introduction to the engine assembly and its associated components. Specific information on part identifying, operating and maintaining your engine is found in the manufacturer's OEM manual. Our discussions will touch on the following items:

1. Engine / Transmission
2. Engine Fluids
3. Engine Operations
4. Exhaust
5. Maintenance

---

### 11.1 Engine / Transmission

---

Your Hunter sailboat comes equipped with auxiliary power, a diesel engine. The standard engine is a 29HP shaft drive model with an optional 40HP saildrive model available. Proper attention to and maintenance of your engine will assure you of many hours of pleasurable, safe boating, and will prevent unnecessary engine problems.

You must, therefore, become a student of your engine and be thoroughly familiar with all aspects of proper operations as outlined in the manufacturer's OEM manuals. In addition, follow their recommended maintenance and warranty schedule. Engine abuse or improper maintenance may adversely affect any possible claims made under the independent warranty provided by the engine manufacturer.

*NOTE: All illustrations in this manual depict the 40HP engine.*

#### 11.1.1 Engine

The engine can be accessed through multiple locations, depending on the desired angle of approach. Points of access are from the aft cabin (lift up engine cover - left side Fig. 11.1), galley (remove door with push button latch - right side Fig. 11.1), companionway (lift up hinged step - left side Fig. 11.2), and head (remove door with push button latch - right side Fig. 11.2). As a visual point of reference, each point of access picture (of the 29HP engine with sail drive) is accompanied by a illustration with the same orientation. In addition, see Figure 11.3 for a profile illustration of the 21HP engine layout with shaft drive.

#### 11.1.2 Transmission

In general, the engine assembly is often referred to as 2 associated components: the engine and the marine gear or transmission. The 21HP engine propulsion assembly includes the straight shaft that bolts to the marine gear. The 29HP engine propulsion assembly includes a sail drive which incorporates the marine gear in the one assembly.

The transmission has a reduction gear which drives the propeller at a slower rotation speed than that of the engine. For the 21HP engine, the propeller shaft is mounted to the transmission and passes through the hull within the stuffing box (see Underwater Gear chapter of this manual for a description of the stuffing box). For the 29HP engine, the sail drive passes through the hull and is protected from water breach with gaskets.

#### 11.1.3 Nameplates

A nameplate is attached to the rocker arm cover (top of engine) and provides the following information:

1. model
2. gear model
3. continuous power (kw)
4. Speed of prop shaft
5. fuel stop power (kw)
6. engine number
7. manufacturing date

A nameplate is attached to the transmission and sail drive and provides the following information:

1. model
2. gear ratio
3. oil
4. manufacturer's number

This information will be important when communicating with the engine manufacturer or Marlow-Hunter regarding warranty, parts and service



**When near the engine or any area where mechanical equipment is located, always be aware of moving parts or components. Death or dismemberment may result if entangled in moving machinery.**

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## Engines and Transmissions

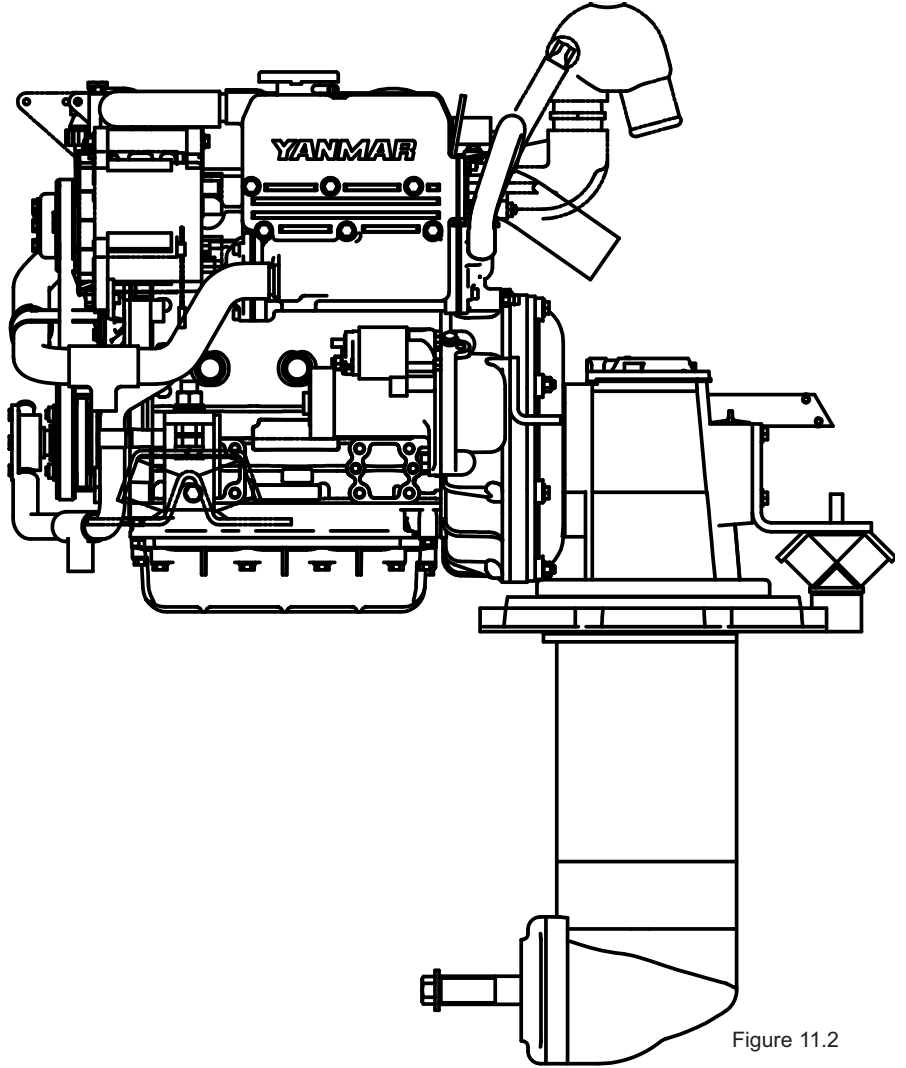
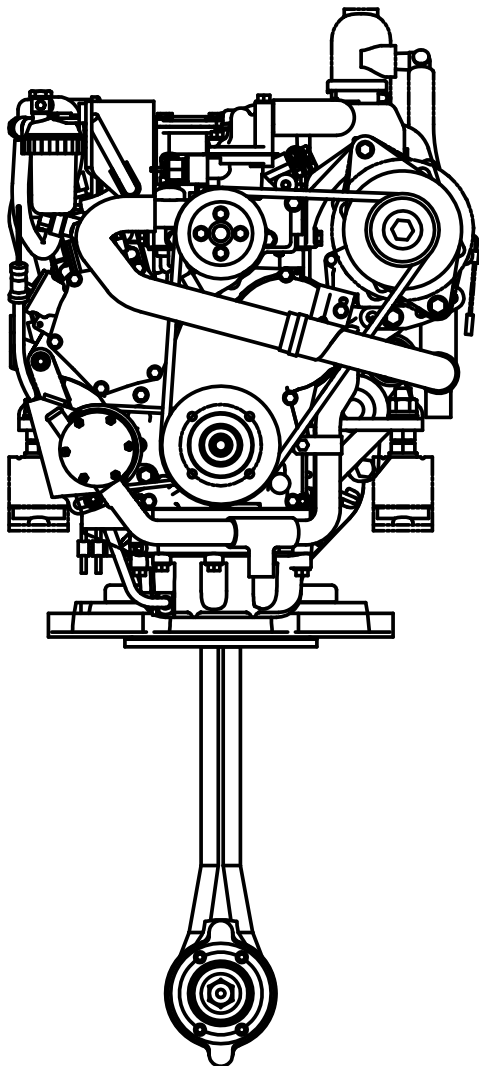
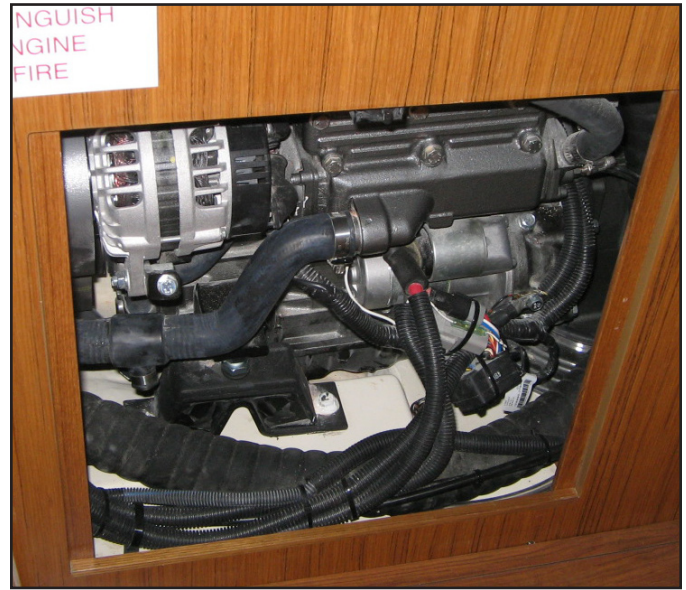


Figure 11.2



## Engines and Transmissions

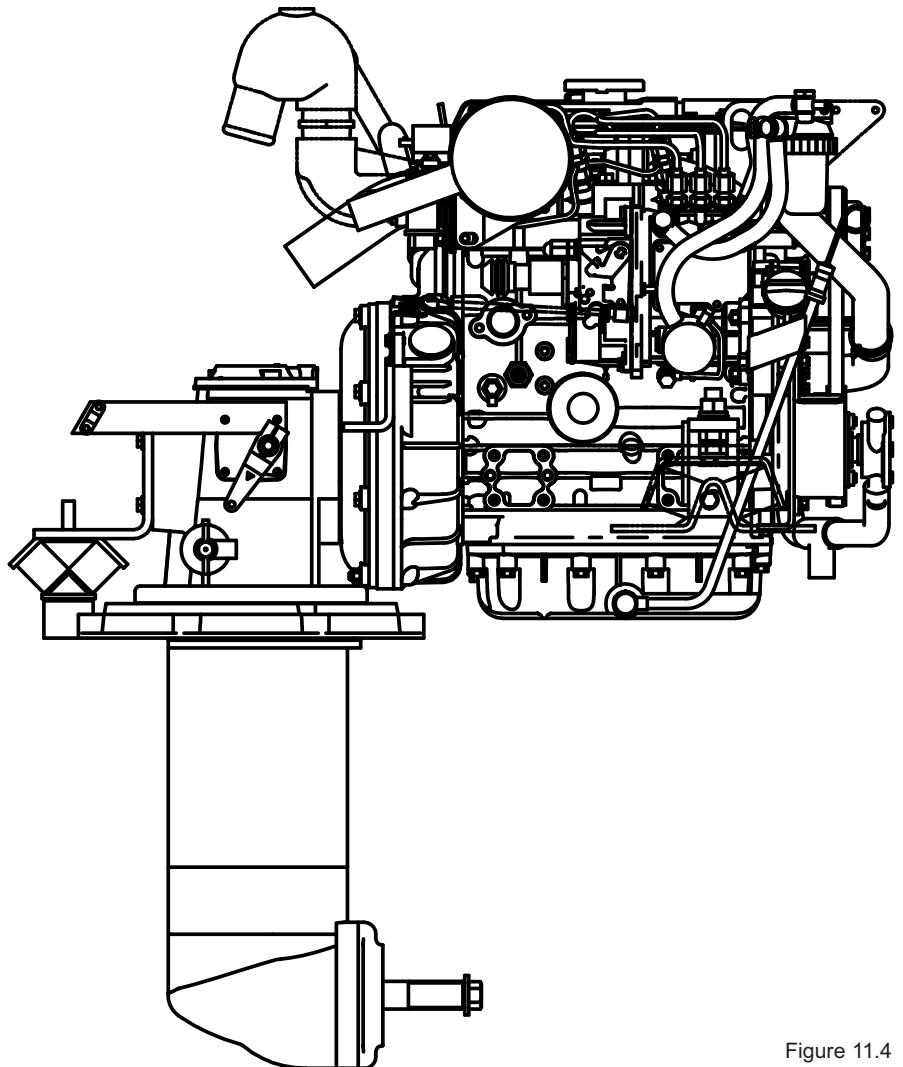
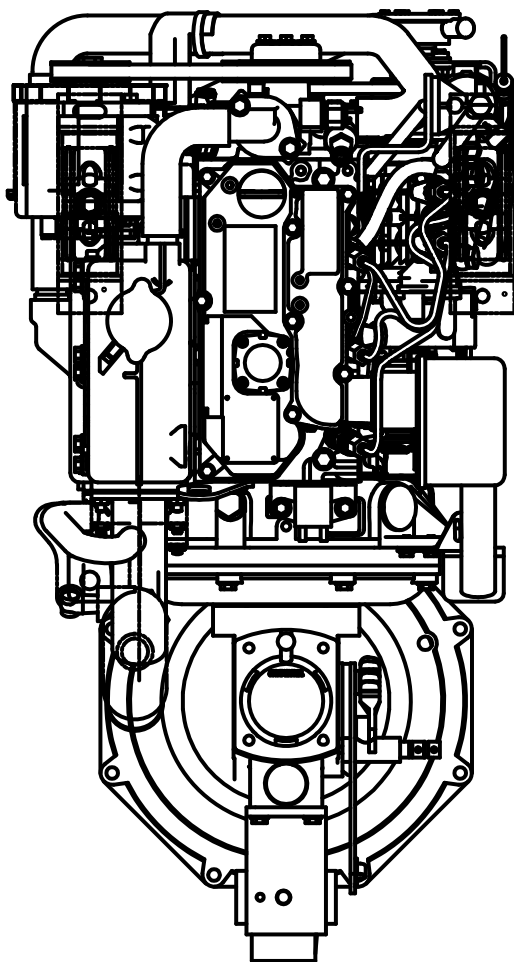


Figure 11.4

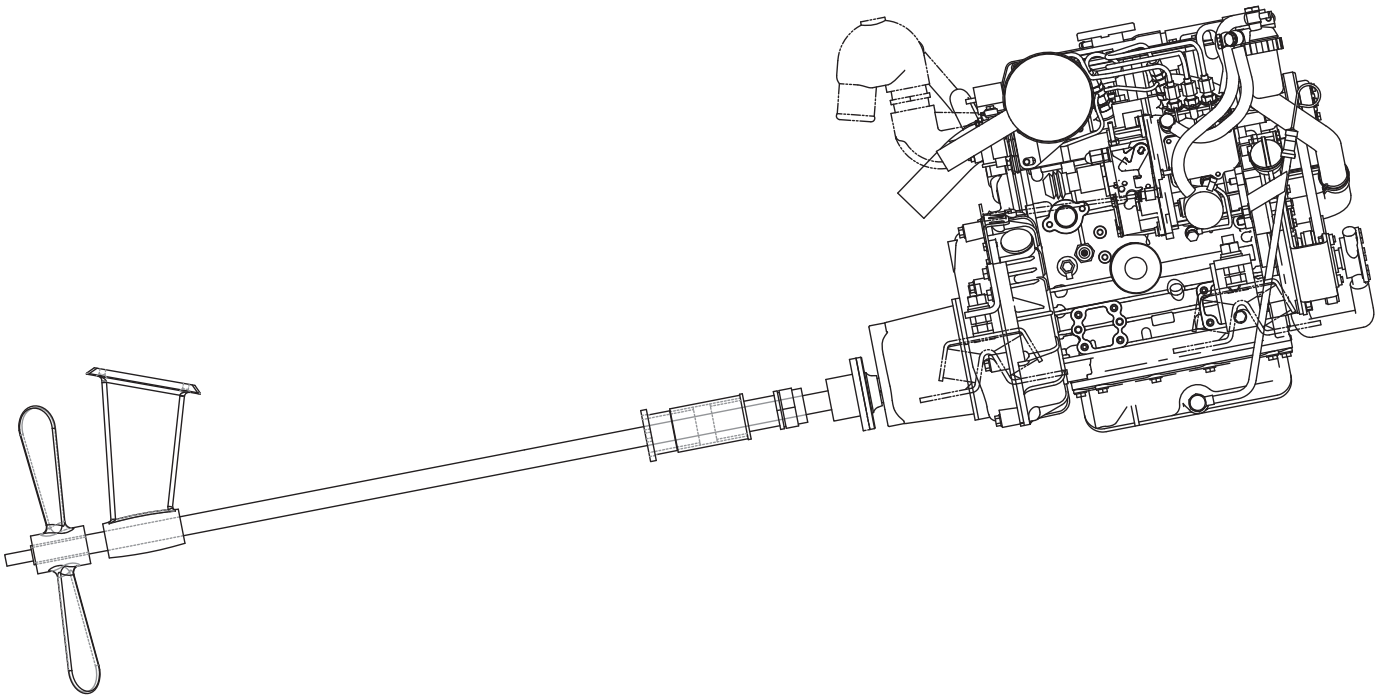


Figure 11.3

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**Take proper care when washing down or cleaning your engines and ensure water does not enter the air intakes. Water in the air intakes may go directly to the cylinders, resulting in rust and possibly internal engine damage.**

---

*IMPORTANT: The engine manual supplied by the manufacturer includes complete and detailed information about operating and maintaining your boat's engines. Be sure to read it. Do not start or operate the boat's engines until you have done so. The life and performance you receive from your engines depends greatly on the way you care for them.*

*IMPORTANT: Engines are not warranted by Marlow-Hunter. Engine warranties are provided by the engine manufacturer.*



Figure 11.4

### 11.1.4 Engine Mounts

The engine mounts installed in your boat (Fig. 11.4 sail-drive mount) are designed by the engine manufacturer for your specific engine. These mounts affix the engine to the boat and, depending on your engine model, are adjustable vertically and/or horizontally for proper alignment. Vertical alignment is conducted by loosening or tightening the stud nut; horizontal alignment is conducted by sliding the stud side to side through the notches in the mounts.

*IMPORTANT: It is advisable to spray a protective coating on the studs to prevent corrosion.*

The engine mounts also contain isolators which serve to isolate the engine from the boat stringers or supports to dampen vibration, noise and other undesirable effects from engines. For more information about the engine mounts see the engine manufacturer's OEM manual and the Underwater Gear chapter in this manual.

### 11.2 Engine Fluids

Monitoring the status of your engine fluids on a consistent basis is critical. Follow the engine manufacturer's guidelines and procedures for managing your fuel, engine oil, gear or saildrive oil and coolant.

#### 11.2.1 Fuel

In addition to the OEM manual, refer to the Fuel System chapter in this manual for information on the fueling process and other details.

#### 11.2.2 Oil

Refer to the OEM manual.

#### 11.2.3 Coolant

The engine cooling system involves two separate but related systems:

1. The raw water cooling system - refer to the Water Systems and Waste Systems chapters of this manual for a detailed description of the raw water system supply and removal.
2. The internal engine cooling system - supplied by the engine manufacturer. This closed system features an antifreeze coolant reservoir attached to the engine. Internal coolant is circulated through the engine in separate channels from the raw water cooling system.

The raw water cooling system works with the internal engine cooling system by cooling the internal system's coolant through the heat exchanger. Additionally, the antifreeze coolant cycles through the water heater where it heats the fresh water system through its heat exchanger, taking advantage of the engine operation (see the Waste Systems chapter in this manual for a heat exchanger hose layout).

**NOTE:** Ensure the raw water engine intake valves are open (refer to the Water Systems chapter in this manual) before you start the engine. Failure to open them will cause damage to the water pump impeller.

**NOTE:** Refer to the engine manufacturer's OEM manual for details on monitoring and maintaining your engine's coolant system.

### **! DANGER !**

Hot coolant under pressure may boil over and cause burns or other personal injury if the pressure cap is removed when hot. Allow engine to cool. Open pressure cap slowly to allow pressure to vent before removing cap.

### 11.3 Engine Operations

#### 11.3.1 Start / Stop

The engine start panel is located on the starboard forward cockpit face (Fig. 11.5).



Figure 11.6

For instructions on starting/stopping your engine, please refer to the Getting Underway chapter of this manual.

**NOTE:** Excessive cranking could cause seawater to enter the cylinders and damage the engine, also known as hydrolock. If the engine does not start after cranking for 15 seconds, close the thru-hull water intake valve to avoid filling the muffler with water. Crank for 10 seconds at a time until the engine starts. When the engine does start, stop the engine immediately and turn off the power switch. Be sure to re-open the seacock and restart the engine. Operate the engine normally.

### **! WARNING !**

**Engine manufacturers do not warranty items damaged by hydrolock.**

Also, refer to the DC Electric section of this manual for details on the controls and protection of engine circuitry including the engine start panels.

### 11.3.2 Controls

The boat's engine controls (throttle) is located on the starboard side of the pedestal (Fig. 11.6).

Neutral is in the center or vertical position. Moving the lever forward will engage the engine forward. Moving the lever backward will engage the engine in reverse. Additional movement of the lever in a direction will increase power in that direction.



Figure 11.6

**IMPORTANT:** Shift the transmission only when the engine speed is at or below 1000 rpm. Shifting at higher engine speeds could severely damage the boat, the transmission and the engine. Allow the transmission to remain in neutral for a few

*seconds before reversing the rotation of the propeller.*

### 11.3.3 Monitoring and Emergency Response

Engine status and performance alerts will be communicated through the engine start panel gauge (left side Fig. 11.5). Alerts will be conveyed by red lighted panel symbols and an accompanying audible buzzer. Fig. 11.7 illustrates the engine start panel gauge with the potential alerts noted.

The engine manual states the maximum RPM rating established by the engine manufacturer. Do not exceed this rating as indicated by the tachometer. Check the manual for additional information about maximum RPM's.

If alerts are communicated, immediately shut down the engines and determine the source of the alert. Consult the engine manufacturer's OEM manual for the proper procedures to correct.

### **! CAUTION !**

**Always monitor your boats engine panel for alert displays while underway, even if your engine systems are equipped with an alert alarm.**

**Immediately shut down the engines if gauges are not in normal ranges or an alarm sounds.**

**Do not restart your engines until all alerts are corrected.**



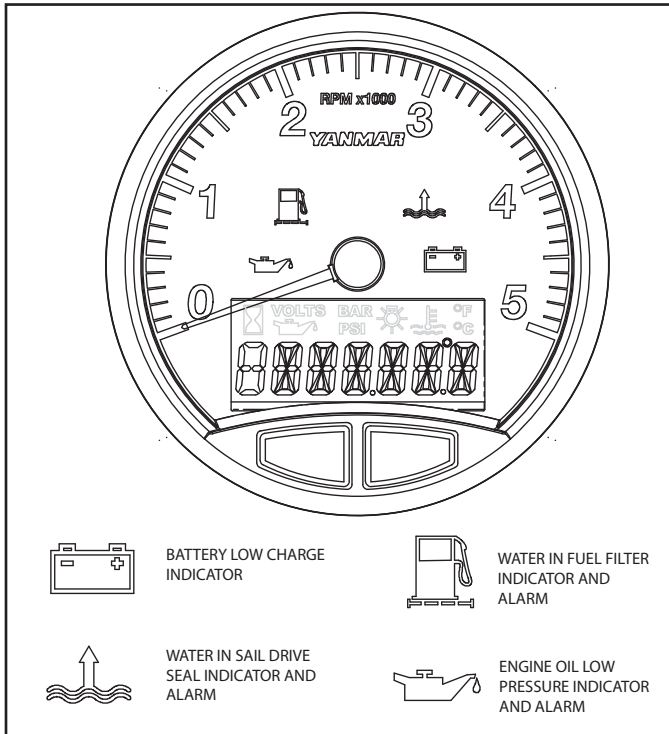


Figure 11.7

- **Engine shutdown:** A sudden engine shutdown while the boat is moving may force water into the exhaust system.
- **Anchored or adrift:** When anchored from the stern, pulling a sea anchor or adrift, rough seas may rock your boat severe enough to cause water to splash out of the mufflers into the engine while the engines are shut down.
- **Improper hoisting:** Operators are sometimes tempted to reduce hoisting time for propeller changes by hoisting only the boat stern. Such hoisting can cause residual water in the exhaust system to enter the engine cylinders.
- **Engine start problems:** Repeated attempts to start the engine will cause water to collect but without sufficient pressure to eject it. Refer to the Water Systems chapter of this manual for water control when starting.

Be aware of the potential of hydrolock and avoid these conditions.

### **⚠ DANGER ⚠**

**Avoid the exhaust outlets, lines, hoses or equipment when the engines have been run for a period of time. These areas may be very hot! You can be seriously burned by the exhaust system after the engines have ran for a period of time. To avoid injury, allow the exhaust system to cool before handling or making adjustments to avoid injury.**

## 11.4 Engine Exhaust

Engine exhaust must be properly routed and vented externally. Please refer to the Waste Systems chapter in this manual for your boat's exhaust system layout. The engine exhaust contains Carbon Monoxide (CO). Please read and understand the Boating Safety Chapter of this manual and know the dangers of CO and how to avoid them. Carbon Monoxide will kill you, and in most situations, by the time you know something is wrong, it could be too late. Be proactive and know what to look for and what to do before a situation becomes critical.

Inspect your boat's exhaust system frequently, or have a qualified service technician service the system to ensure that there are no leaks. Always verify the exhaust clamps are tightened throughout the system. Keep the necessary tools on hand to perform this action.

### 11.4.1 Hydrolock

Hydrolock is caused by water entering the engine cylinders through the exhaust. The following conditions can cause hydrolock.

## 11.5 Maintenance

As with automobile engines, your marine engine requires specific maintenance within certain periods of time, such as the engine break-in period. Again, become thoroughly familiar with and perform these maintenance procedures as scheduled and specified by the engine manufacturer. Such an approach will only positively affect your engine's life.

Should you have any questions regarding engine maintenance or operations not found in the OEM manuals, please contact your boat dealer or Customer Service.

## Engines and Transmissions

Troubleshooting		
Problem	Possible Cause	Solution
Engine not starting	No fuel reaching engine	Fuel tank vent blocked. Clean hose and fitting to remove material. Make sure hose is not pinched.
	Improper starting procedures	Fuel line obstructed. Check fuel lines. Make sure line is not pinched Clogged engine fuel filter. Refer to engine manual for instructions on cleaning filter.
	Contaminated fuel	Fuel supply valve closed at tank. Open valve. Review starting procedures in engine manual. Inspect for water or other contaminants in fuel. If contaminated, drain tank and flush with fresh fuel.
Engine starter not cranking	Discharged battery	Recharge or replace battery.
	Corroded battery terminals	Clean battery terminals.
	Loose battery terminals	Tighten connections.
	Bad starter switch	Test switch continuity. Replace switch if required. See your dealer for service. Replace switch.
	Hydrolock	See instructions in this Section under "Hydro-Lock". Contact your dealer immediately.
	Jammed "starter drive."	Loosen starter motor, then free stuck gear.
Engine speed erratic	Pinched or clogged fuel lines	Replace line or remove obstruction. See your dealer for service.
	Contaminated fuel	Drain fuel tank and lines. Flush with clean fuel and replace fuel filters. See your dealer for service.
Engine running rough	Defective fuel pump	Have your dealer check pump. Check idle speed and adjust as needed.
	Idle speed too low	See your dealer for service.
	Faulty ignition system components	Clean or replace filter.
	Clogged fuel filter	Straighten lines.
	Pinched fuel lines	Remove obstruction.
	Clogged fuel lines	Clean vent.
	Blocked fuel vent	

## Engines and Transmissions

Engine overheating	Cooling water seacock closed Seacock pickup blocked Collapsed water pump suction hose	Open seacock. Remove obstruction. Replace hose.
Sudden increase in	Cooling water intake system blocked	Clean seacock strainer.
Engine temperature	Water intake hose leaking or ruptured	Remove material blocking line.
	Water pump failure	See your dealer for service.
Drop in oil pressure (engine running at constant speed)	Lubrication system leaking  Defective oil pump Pinched oil lines to remote filters	Repair if possible. See your dealer for service. See your dealer for service. Reroute if possible. See your dealer for service.
Excessive vibration	Loose engine mounting bolts Engine not timed properly or misfiring Engine-to-shaft couplings out-of-round or off-center Engine misaligned Worn strut or transmission	Inspect and tighten as required. See your dealer for service.  See your dealer for service. See your dealer for service. Replace bearings if needed. See your dealer for service.
Poor performance	Boat overloaded Weight poorly distributed  Excess bilge water Damaged or incorrect propeller  Fouled or damaged hull bottom Engine misaligned	Reduce load. Distribute weight evenly. Trimming may help. Pump out water. Check for leaks. Inspect propeller. Replace if necessary. Inspect, clean, or repair. See your dealer.
Low cranking speed	Loose or dirty electrical connections  Low battery charge Defective battery Engine oil too heavy for prevailing temperatures	Check all related electrical connections and wires. Charge battery. Replace battery. Drain oil and refill with correct grade viscosity oil. See engine manual for correct grade and viscosity.
Poor acceleration	Throttle not full open  Engine overheating	Inspect cables and linkage for binding, obstructions, and loose fasteners. See solutions under "Engine Overheating" problem.
Excessive fuel consumption	Restriction in air filter	Remove filter and clean or replace

## Engines and Transmissions

Low oil pressure	<p>Insufficient oil in crankcase</p> <p>Excess oil in crankcase</p> <p>Diluted or improper grade and viscosity oil</p> <p>Oil leak in pressure line</p>	<p>Check and add correct grade and viscosity oil. Visually check engine for leaks.</p> <p>Check and remove required amount of oil. Check for cause of excessive oil (improper filling, bad fuel pump, etc.).</p> <p>Change oil and oil filter. Be sure to use the correct grade and viscosity oil.</p> <p>Inspect all oil lines and tighten all connections as necessary.</p>
No oil pressure	<p>Defective gauge, gauge tube, or oil line</p> <p>No oil in engine</p>	<p>Replace gauge or gauge sender</p> <p>Refill crankcase. See engine manual for proper grade and viscosity.</p>
High oil pressure	<p>Too heavy grade of oil</p> <p>Dirt or obstruction in oil line</p>	<p>Drain oil and replace. See engine manual for proper grade.</p> <p>Drain and clear oil system.</p> <p>Check for bent or flattened oil lines and replace as necessary</p>
Sludge in oil	<p>Infrequent oil changes</p> <p>Dirty oil filter</p> <p>Water in oil</p>	<p>Drain oil and refill with oil of proper grade and viscosity.</p> <p>Replace filter.</p> <p>Drain oil and refill. See your dealer if problem persists.</p>
Transmission shifts hard	Corroded or pinched linkage	Lubricate or replace linkage as needed.



## Engines and Transmissions

Notes:

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MARLOW-HUNTER, LLC

*Chapter 12*

***Sails  
and  
Rigging***

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***MH31***



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**M**arlow-Hunter's continuous design goal for the sail and rigging layouts is maximum performance with safe and undemanding management. The conventional or optional furling rigs, the design of the sails, deck layout/hardware placement and an organized and clutter free line management all work together to provide a fluid and exciting sailing experience. Marlow-Hunter has and continues to be on the industry's leading edge of sail and rigging innovation.

If this is your first boat of this type or are changing to a new and unfamiliar boat, please ensure you obtain handling and operating experience before assuming command. The information in this chapter is not intended as a course on boating safety or seamanship. To gain sailing experience and knowledge, your dealer, national sailing federation or yacht club will be pleased to advise you of local sea schools and/or competent instructors.

As always, never underestimate the potentially dangerous power of wind, tide and the sea. Ensure there is sufficiently trained and proficient crew on board to handle the boat and its operating systems even in adverse conditions.

### **⚠ WARNING ⚠**

**Refer to the Boating Safety, and the Getting Underway chapters for safe boat handling information.**

The rig of your boat refers to the mast, boom, rigging and integrated hardware (Fig. 12.14). This chapter will specifically discuss the following rig and sail categories:

1. Mast
2. Standing Rigging
3. Boom
4. Mainsail
5. Head Sails
6. Running Rigging
7. Rigging the boat
8. Sail Reefing and Stowing
9. Supporting Hardware

## 12.1 Mast

Your main and most vital rig component is the mast, also referred to as the main spar. It carries the sails and is supported by the standing rigging (see section below on

Standing Rigging). Marlow-Hunter provides a conventional mast as standard allowing full control of mainsail management to the sailor. Marlow-Hunter also offers an optional roller furling mast providing easier mainsail stowage and deployment by rolling the mainsail in or out of the mast. (The choice between conventional or in-mast furling will also impact the boom, running rigging and the mainsail - all discussed in subsequent sections.)

The mast also provides the perch for navigational lighting along with weather instruments.

Attaching the mast is referred to as stepping the mast and is part of the commissioning process. Your Marlow-Hunter is a deck stepped mast. The mast base is positioned onto a receiver, or mast step (Fig. 12.1), located on the deck. Mast stability and support is provided by the standing rigging (strategically placed cables and hardware) and the compression post, which provides deck support beneath the mast's position. Stepping the mast will require the assistance of a crane and should only be done by trained and experienced riggers.

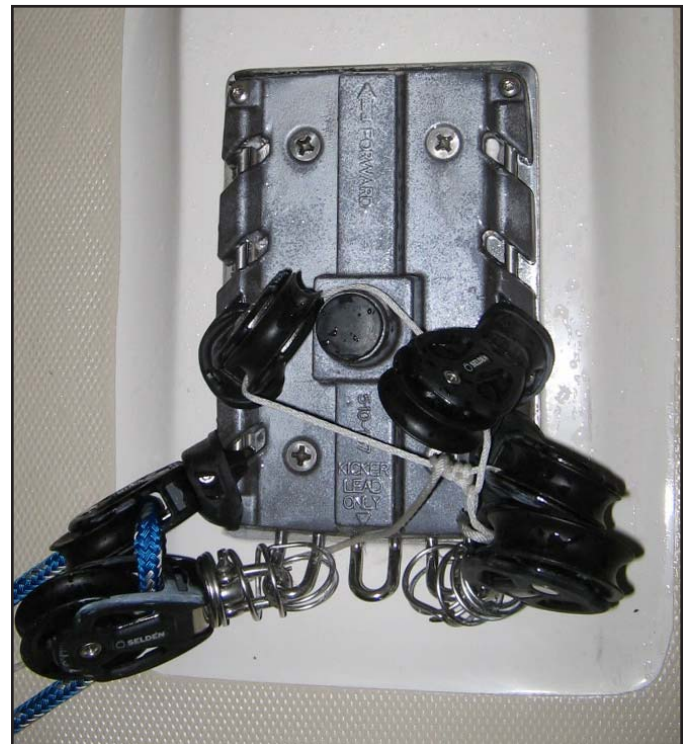


Figure 12.1

Your Marlow-Hunter is considered a fractional rig. This refers to the positioning on the mast of the support cables (stays/shrouds) below the top of the mast (masthead).

## Sails and Rigging

The mast features a double swept-back spreader arrangement. Spreader are horizontal spars used to spread the supporting mast shrouds to provide the desired stability and strength to the mast. This rig arrangement, known as the B&R rig (named after its designers Lars Bergstrom and Sven Ridder), sweeps the spreaders aft 30 degrees, thereby creating an equidistant 120 degree angle between each rigging point. This tripod arrangement is the same as used with radio towers, providing excellent strength and stability without the need for an aft stay (backstay). The elimination of the backstay allows a more efficient mainsail shape utilizing a full roach design.

After the mast has been stepped and standing rigging installed (see below), it should be properly tuned before serious sailing begins.

### 12.2 Standing Rigging

Standing rigging is the collection of fixed cables and hardware which provide stability and strength to the mast. Cables can be either stays or shrouds. Stays run fore and aft from the mast to the hull. Your Marlow-Hunter only uses the forestay and is integrated into the roller furling jib (see sections on the Jib and Running Rigging below). Shrouds run symmetrically port and starboard of the mast. In addition to vertical and diagonal shrouds, the B&R rig includes reverse diagonal shrouds which allow a mast prebend providing additional rigidity. Shroud connection points can be either the mast or a spreader and terminate at the deck chainplates. Chainplates are substantial metal components tied into the hull with attachment points extending into the deck. Chainplates can be classified as outer or inner, depending on their hull attachment point.

Refer to Figures 12.16 and 12.17 for the location, description and specification of individual components of the standard rigging. Refer also to the Rigging the Boat section below for installation instructions. Finally, refer to the rigging manufacturer's OEM manual for further details on standing rigging installation.

*NOTE: Standing rigging will stretch slightly when initially loaded. Therefore, the rigging may have to be further tensioned slightly after a few sails in a strong breeze to compensate for this initial stretch. Once the mast is tuned and initial stretch is taken out, the rig should need retuning only at the beginning of each season.*

### 12.3 Boom

The boom is a horizontal aft-facing spar attached to the aft mast. It provides control of the shape and angle of the mainsail and provides points of attachment for control lines.

The boom is attached to the aft mast at the gooseneck. The end-cap of the forward boom has a casting (Fig. 12.2) which is bolted into the mast fitting (Fig. 12.3). This hardware configuration will allow the boom to pivot port and starboard (and up and down) allowing the mainsail to harness the wind power.

The type of boom on your boat will correspond to the type of mast, either the standard conventional mast or the optional in-mast roller furling mast. Both booms will have common and some unique control points for the corresponding lines used. The conventional boom will have a slot on the top where an optional sail cover can be installed. The roller furling boom will use the slot on the top as the traveling path for an outhaul car used to facilitate the furling process.



Figure 12.2



Figure 12.3

### 12.4 Mainsail

The mainsail is a triangular shaped sail located behind the mast and is the largest sail on your boat and main source of propulsion by wind. Marlow-Hunter provides the conventional mainsail as standard and the in-mast roller furling mainsail as optional. The shape of the respective sails will be slightly different. The conventional mainsail will have a larger sail area than the roller furling mainsail and will include a larger roach. The smaller size of the furling mainsail derives from the constraints of the furling method and corresponding mast weight (see

## Sails and Rigging

Figures 12.4 for general sail terminology and 12.15 for sail specifications).

When strong winds exist one can decrease the sail area by reefing (see the Sail Reefing and Stowage section below) the mainsail to provide more stability and less risk. Reefing the conventional mainsail involves lowering the sail to predetermined levels, called reef points (Marlow-Hunter sails usually consist of 2 reef points). Along these reef points are a pair of cringles. These cringles are used by the reef lines (part of the running rigging) to pull the sail down to the reef point. Reefing the in-mast furling mainsail simply involves furling the mainsail within the mast until the sail area is considered safe and effective.

### 12.5 Headsails

Marlow-Hunter provides a jib headsail as part of the standard sail configuration. Also available is the rigging and hardware necessary to fly an optional spinnaker headsail (sail not included).

#### 12.5.1 Jib

The jib is a triangular shaped sail located forward of the mast and is your boat's main headsail. The jib's main role is to provide overall stability and performance. Given its sail area, its direct contribution to propulsion is secondary compared to the mainsail (see Figures 12.4 for general sail terminology and 12.15 for sail specifications).

The standard jib is a roller furling arrangement. It is integrated into the forestay which swivels and rolls up when furling or reefing the sail. The jib is raised by using the jib halyard (see Running Rigging section below). The jib is unfurled and trimmed by using the jib sheets (see Running Rigging section below).

#### 12.5.2 Spinnaker

The spinnaker is a more specialized sail designed for sailing off the wind (reaching to running) and is significantly larger than the jib. The spinnaker option includes the hardware and rigging necessary to support an asymmetrical spinnaker. The styling of the sail is often a reflection of the owner or operator and, as such, is generally best served through direct sourcing by the owner or operator.

The sail is arranged with the tack attached to the forward facing eye on the stem plate. The sail is raised by the spinnaker halyard (see Running Rigging section below).

The clew is managed by port and starboard sheets terminating in the cockpit and served by the helm winches.

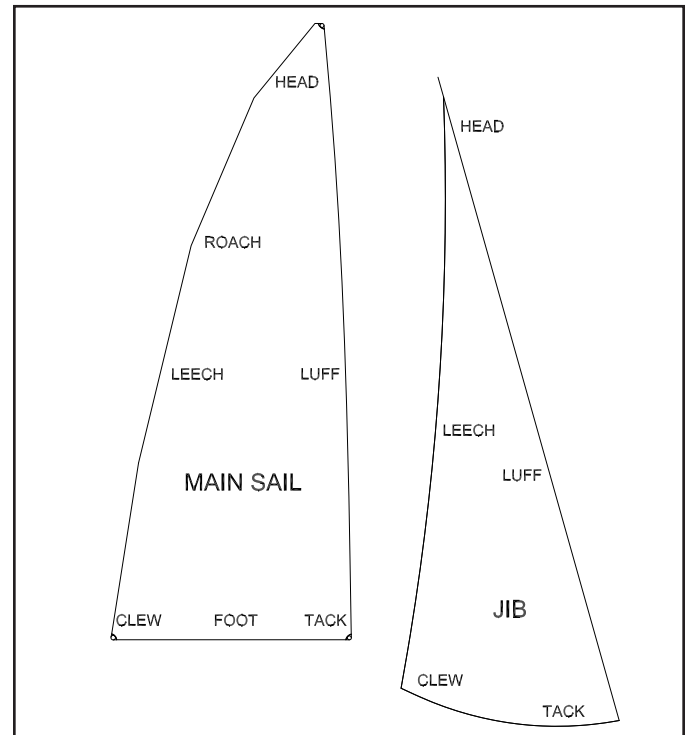


Figure 12.4

### 12.6 Running Rigging

Running rigging consists of lines used on your boat to raise, lower and control the sails. They will vary in length, thickness and color, depending on their purpose. Your Marlow-Hunter features control of all running rigging (except the topping lift and, depending on your model, the vang line) from the cockpit. The running rigging includes the following lines as specified in Fig. 12.18 and discussed in subsequent sections:

1. Main halyard - raises the mainsail
2. Jib halyard - raises the jib
3. Topping lift - supports/raises the boom
4. Main furling line - used to furl the mainsail into the mast with the in-mast furler system
5. Outhaul - pulls the mainsail along the boom
6. Mainsheet - used to control lateral movement of the boom and thereby controls the clew of the mainsail



7. Jib sheet - set of two lines, one port, one starboard, used to control the clew of the jib
8. Traveler - set of two lines, one port, one starboard, which facilitates the movement (travel) of the boom
9. Vang - a block and tackle assembly attached to the boom (and mast) and controls the mainsail leech tension; an optional solid vang is reinforced with tubes, similar to a shock
10. Spinnaker halyard - raises the spinnaker (optional sail)
11. Reef line 1 - lowers the mainsail to the first reef position
12. Reef line 2 - lowers the mainsail to the second reef position
13. Spinnaker sheet - set of two lines, one port, one starboard, used to controls the clew of the spinnaker

### 12.6.1 Main Halyard

The main halyard raises the mainsail. For the conventional mast, the mast end of the halyard is shackled externally to the head of the sail. The line then rises to the masthead and over a sheave (pulley). It then travels back down the mast internally to an exit point on the starboard side. From there it continues to the mast base where it runs around a block (pulley) to the starboard organizer. It continues from the organizer to under the sea hood and to the sheet stopper (jammer). From the sheet stopper the line can then be used by the winch for additional torque when raising.

For the furling mast, the main halyard path is similar, however, the mast end is attached internally to a swivel. This swivel travels up and down the furling foil (which holds the mainsail luff and revolves when furling or unfurling). From the swivel, the halyard runs up to the mast head and over the masthead sheave. It then continues the same course to the cockpit as the conventional main halyard.

### 12.6.2 Jib Halyard

The jib halyard raises the roller furling jib. The mast end is attached externally to a swivel. This swivel travels up and down the jib furling foil (which revolves when furling or unfurling) and is integrated within the forestay. The halyard rises up to a sheave box, first box below the forestay attachment, and over the sheave. It then travels back down the mast internally to an exit point on the port side. From there it continues to the mast base where it runs

around a block to the port organizer. It continues from the organizer to under the sea hood and to the sheet stopper. From the sheet stopper the line can then be used by the winch for additional torque when raising.

### 12.6.3 Topping Lift

The topping lift supports or raises the boom. The mast end of the topping lift is shackled to the aft end of the boom. It then rises to the masthead and over a sheave. It travels back down the mast internally to an exit point and lashed to a cleat on the mast.

### 12.6.4 Main Furling Line

The main furling line furls the mainsail (see the next section on Boom Outhaul, which unfurls the mainsail) within the optional in-mast roller furler and does not exist with the standard conventional mainsail. This continuous line (ends spliced together) forms a loop. At the mast, the line is saddled over the reefing winch with both sides traveling down to the mast base where they run around a mast block to the port organizer. Both lines continue from the organizer to under the sea hood and to the sheet stopper. From the sheet stopper the lines can then be used by the winch for additional torque when furling. After the winched line passes around the winch it exits the winch and begins its journey back to the mast.

### 12.6.5 Mainsail Outhaul

The outhaul pulls the mainsail aft along the boom and controls the shape of the curve of the foot of the sail. If the rig is for a conventional mainsail, the mast end of the boom outhaul is attached to the mainsail clew and travels toward the aft boom cap.

If the rig is for a in-mast furling mainsail, the mast end of the boom outhaul line is knotted to the forward slider position on the outhaul car. It travels up and around the mainsails clew sheave and down and around the outhaul car's aft block toward the aft boom cap.

The line enters the boom by traveling down and around a boom end cap sheave and forward toward a sheave near the mast. It travels around the sheave and exits the boom near the gooseneck. It continues down to a farilead (ring) mounted on the mast and on to the mast base where it runs around a mast base block to the starboard organizer. It continues from the organizer to under the sea hood and to the sheet stopper. From the sheet stopper the line can then be used by the winch for additional torque when pulling.

### 12.6.6 Mainsheet

The mainsheet controls the lateral movement of the boom and thereby the mainsail clew. The amount of tension on the mainsheet determines the extent of the boom's lateral movement or travel. This travel is facilitated and controlled by the mainsheet traveler assembly located on the top of the arch (see Traveler section). The mainsheet is a double open ended line which starts and ends in the cockpit. The "end" of the line runs through a cam cleat positioned on the port arch rail's inboard side and leads to the port helm winch. From the cam cleat it travels up and around the arch's port over-the-top block and travels inboard to the arch's center stand-up block. The line continues around the center stand-up block to and around the aft boom's bottom aft block and back toward the traveler. It then is routed around the traveler car block and back to the boom. It continues around the aft boom's bottom forward block and enters the aft boom. The line travels forward to the sheave near the mast and continues around the sheave. It then exits the boom near the gooseneck down to the mast base where it runs around a block to the starboard organizer. It continues from the organizer to under the sea hood and to the sheet stopper. From the sheet stopper the line can then be used by the winch for additional torque when trimming.

### 12.6.7 Jib Sheets

The jib sheets are a pair of lines that control the jib clew and the shape of the sail. One of which is used at a given time. Each line is attached to the jib clew with one line running around the inner shroud to the port jib track sheave car and the other to the starboard. Each line then ends at a helm winch which can be used for additional torque when trimming.

### 12.6.8 Jib Furling Line

The jib furling line furls the jib (see the previous section on Jib Sheets, which unfurls the jib). The line exits the jib furling drum and runs starboard aft to the first stanchion block located on the bowrail. The line continues aft through the balance of stanchion blocks and tied off at the cleat located on the starboard coaming.

### 12.6.9 Mainsheet Traveler Lines

The mainsheet traveler lines are a pair of lines that control and facilitates the lateral movement of the boom. Both line ends are located within the cockpit. Both lines origi-

nate from the arch top and are generally mirrored port and starboard. The line arrangement exists to control the movement of the traveler block car as it travels on its track. Each line is attached to the traveler end block and travels inboard to the traveler car's aft control sheave. It travels around the control sheave and back to and around the end block to the traveler car's forward control sheave. It continues around the control sheave and outboard to and around the over-the-top or under-the-top block down to the cam cleat mounted to a plate or rail on the inboard arch leg.

### 12.6.10 Vang Line

The vang line is used to apply downward force on the boom and thus the shape of the sail. The vang is attached to the base of the aft mast and to the bottom of the boom, generally forming a 45 degree angle. The standard vang is a block and tackle arrangement. The optional rigid vang (standard with the in-mast furler) is a piston arrangement controlled by the vang line. From the vang, the line exits the assembly from the top boom end and travels to the mast base where its tied to the mast base.

### 12.6.11 Spinnaker Halyard

The spinnaker halyard raises the optional spinnaker or reaching sail. The mast end is shackled to the head of the spinnaker and travels up to the forward mast sheave box located above the jib sheave box. It passes over the sheave and down the mast internally to an exit point on the port side. From there it continues to the mast base where it runs around a block to the port organizer. It continues from the organizer to under the sea hood and to the sheet stopper. From the sheet stopper the line can then be used by the winch for additional torque when raising.

### 12.6.12 Reef Line 1

Reef line 1 lowers the mainsail to the first reef point. The line exists for the standard conventional mainsail only. The sail end of the line exits the top of the aft boom from the end cap sheave and travels up and through the first cringle near the clew. It travels down to the boom where it is looped around the boom and knotted. The other end, which emerges from within the forward boom, travels up from the forward boom sheave to and through the lower forward cringle near the tack and down through an eyelet immediately above the gooseneck on the mast. It then travels down to the mast base where it runs around a block to the starboard organizer. It continues from the organizer to under the sea hood and to the sheet stopper.

## Sails and Rigging

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From the sheet stopper the line can then be used by the winch for additional torque when reefing

### 12.6.13 Reef Line 2

Reef line 2 lowers the mainsail to the second reef point. The line arrangement is the same as Reef Line 1 (above) except for the reef points are at the second cringle and the line is routed port side.

### 12.6.14 Spinnaker Sheets

The spinnaker sheets are a pair of lines that control the spinnaker clew and the shape of the sail. One of which is used at a given time. Each line is attached to the spinnaker clew with one line running around the outer shroud and lifelines aft to the spinnaker block located on the arch. The other sheet is routed around the forestay, outer shroud and lifelines to the opposite spinnaker block. Each line ends at a helm winch which can be used for additional torque when trimming.

mild detergent solution. Lubricate moving parts (i.e. sheaves, etc) with a silicon spray lubricant.

4. Check halyard installation based on the type of rig (conventional or in-mast furling) and optional sails (spinnaker).
5. Verify halyard control ends exit the mast either port or starboard as noted in Figures 12.19 and 12.20. Clean and lubricate any shackles.
6. Verify and test electronic components (anchor light, steaming light and optional wind instrument) installed on the mast are wired properly. Use a 12V battery to test.
7. Verify or install any non-electrical components to the mast-head (i.e. windex, aerials, etc).
8. Clean and lubricate all standing rigging turnbuckles.
9. Verify or attach all standing rigging (Figures 12.16 and 12.17). All adjustable shrouds should be slack. The lower ends of the V1s and D1s will be loose (later installed to the chainplates after stepping).

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## 12.7 Rigging the Boat

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Your new Marlow-Hunter boat will be fully rigged by your dealer during the commissioning process. This includes stepping the mast with standing rigging in place, attaching the boom, installing sails with running rigging in place and tuning the mast.

Stepping and unstepping the mast will inevitably be part of sailboat ownership. Seasonal or long term storage, bridge clearance or repairs may require de-rigging the boat. The following will discuss the process of rigging the sailboat. De-rigging the boat will essentially be the reverse process. Please refer to the rigging manufacturer's OEM manual for additional details on stepping and tuning the mast.

### 12.7.1 Prep the Rig

1. Lay the mast onto two trestles or other appropriate support with luff groove (aft mast) face up. Place the boom and optional solid vang onto two other trestles or supports.
2. Verify or mount the mast spreaders (see the spar manufacturer's OEM Operational Manual). Ensure the mast is elevated enough so spreaders are off the ground.
3. Wash mast, boom and optional solid vang with a

### 12.7.2 Pre-Bend the Mast

*NOTE: Never use anything more than a pair of wrenches to tighten your rigging. Using an extended piece of pipe on the handle of a wrench can over-tighten the rigging and possibly damage the mast or rigging.*

1. Tighten the reverse diagonals RD1 followed by RD2 by the same number of turns to induce the mast bend.
2. Measure the bend by tensioning a line or the main halyard between the masthead and the gooseneck. The maximum amount of bend should be no more than 6" to 8" for the standard mast and 2" to 3" for the furling mast as measured perpendicular from the face of the mast to the halyard at the deepest part of the bend. It can measure less, based on the sail shape and your own preference.
3. Ensure the bend is evenly distributed along the mast to give a smooth shape.
4. Ensure the mast is also straight from side to side. Tighten or loosen the RDs to achieve this. (Note: Always maintain loose D2s until the mast is stepped (see below) and subsequently adjusted from the bosums seat.)
5. Lash the V1s and D1s to the bottom of the mast to prevent their swinging when craning the mast.
6. Attach the jib furler assembly to the mast forestay fitting.

## Sails and Rigging

7. Attach a line to the jib furler drum. This line will be used to minimize swing when craning.
8. Lash the halyards to the bottom of the mast to prevent swinging and intertwining with the shrouds and stay.

*Note: Pre-bending the mast is generally performed by an experienced commissioning agent.*

3. If not, tighten or loosen the intermediate shrouds equal amounts until the mast is centered.
4. Using a tension gauge, tension the V1s to 20%, D1s to 15% and RDs to 12%-15% of their breaking load.

*Note: Tuning the mast is generally performed by an experienced commissioning agent.*

### 12.7.3 Stepping the Mast

1. Ensure the boat is moored securely and positioned under the crane or gin pole.
2. Man the craning procedure with at least 3 persons. One person will hold the lower end of the mast to guide it into the mast-step.
3. Lift the mast using a lifting strap and revolve and lower the base into the mast step. One person should be holding the jib furler line and controlling its movement during this procedure.
4. Once positioned on the mast step, attach the outer shrouds.
5. Attach the jib halyard to a cleat on the bow to support the mast in a raked position where the masthead is approximately 18" behind the step.
6. Attach the inner shrouds.
7. Hand tighten the outer shrouds.
8. Tighten the jib halyard until you can attach the jib furler/forestay to the stemplate. Release the jib halyard.
9. At this point, the masthead should be raked so that a weight hung on the main halyard hangs about 12" behind the mast step.
10. Tension the jib furler/forestay by adjusting the forestay rigging screw (see jib furler manufacturer's OEM manual)
11. Using a tension gauge (Fig. 12.5), tension the outer shrouds to 20% of their breaking load.
12. Disengage the crane strap (may require going aloft).
13. Relocate the boat away from the crane work area.

### 12.7.4 Tuning the Mast

1. Using a halyard, check that the mast is centered from side to side by pulling it tight to one side and marking the halyard next to the outer chainplate shroud.
2. Move to the opposite outer chainplate shroud and verify the mark is the same as the first.



Figure 12.5

### 12.7.4 Boom Installation

1. Man this procedure with at least one person on each end of the boom.
2. Position the boom on the deck with forward end cap immediately aft of the mast with aft end resting on the arch (with traveler car track or sail cover slot facing up).
3. Shackle the topping lift to the aft boom end cap and raise the boom slightly. Verify or route the topping lift as described in the Running Rigging section above. Ensure someone holds the aft end of the boom to stabilize against any sway.
4. Raise the forward boom cap to the gooseneck and attach the boom to the mast with the clevis pin and split pin.
5. Temporarily tie the boom's aft end to the arch with enough slack to allow installation of the vang.

### 12.7.5 Boom Outhaul Installation

1. Verify or route the boom outhaul line as described in the Running Rigging section above (see also Figure 12.21 for furling rig and Figure 12.26 for standard rig).
2. The outhaul should be routed through the inboard

## Sails and Rigging

starboard sheave position within the boom.

3. Lash the sail end of the outhaul to the aft boom end until the mainsail is ready for installation.

### 12.7.6 Traveler Lines Installation

1. Verify or route both traveler lines as described in the Running Rigging section above (see also Fig. 12.22).
2. Route the each line's control ends through the port and starboard cleat block.

### 12.7.7 Mainsheet Installation

1. Verify or route the mainsheet as described in the Running Rigging section above (see also Figures 12.21 and 12.22).
2. The mainsheet should be routed through the outboard starboard sheave position within the boom.
3. Route the control line through the single sheet stopper located on the port arch rail.

### 12.7.8 Vang Installation (Conventional & Solid)

1. Place the vang on the deck immediately aft of the mast. Position the end with the vang cable facing aft.
2. Refer to Fig. 12.23 and attach the vang hardware as directed based on the type of vang (rope or solid).
3. Route the vang line as illustrated in Fig. 12.23.
4. From the mast base block, the line continues to the port organizer for a standard rig or the starboard organizer for a furling rig. From there it travels under the sea hood and on to the sheet stopper.

### 12.7.9 Mainsail Installation

*NOTE: Raising the mainsail should not be done with the wind astern.*

For the standard rig mainsail, complete the following steps:

1. Lower the main halyard and attach the halyard shackle to the clew of the mainsail head.
2. Provide some slack to the mainsheet.
3. Open and remove the inspection port cover near the sail feeder.
4. Insert the first mainsail slider into the aft mast groove.

5. Continue feeding the mainsail sliders into the groove while raising the main halyard until all sliders are installed..
6. Back the remaining luff down the groove until it can be connected to the tack hook).
7. Replace the mast inspection cover.
8. Route the halyard control line down to the mast base block and continue as described in the Running Rigging section above.
9. Position the foot of the sail along the boom and attach the boom outhaul to the clew as described in the Running Rigging section above.

For the furling rig mainsail, complete the following steps:

1. Open and remove the 2 inspections covers on the mast's port side (press button, push up or down, lift opposite end and remove).
2. Locate the sail feeding location on the luff extrusion from the top inspection opening.
3. Feed the head of the sail through the mast slot and into the main foil (Fig. 12.6).
4. Lower the main halyard and attach the halyard shackle to the strap sewn onto the mainsail head (Fig. 12.6).
5. Continue feeding the mainsail into the extrusion while raising the main halyard until the luff is fully inserted into the extrusion.
6. Back the remaining luff down the extrusion from the sail entry location until it can be connected to the tack hook through the lower inspection port (Fig. 12.6).
7. Replace the mast inspection covers.
8. Route the halyard control line down to the mast base block and continue as described in the Running Rigging section above.
9. Position the foot of the sail along the boom and attach the boom outhaul to the clew as described in the Running Rigging section above.

### 12.7.10 Main Furling Line Installation

1. Place a loop of the furling line around the furling winch (Fig. 12.7).
2. Route both sides of the loop to the mast blocks. Remove the sheaves from the blocks and position the lines around the sheaves and replace in the blocks.
3. Continue the lines as described in the Running Rigging section above. The organizer and sheet



stopper will also have to be partially disassembled to allow proper positioning of this continuous line.

Figure 12.7

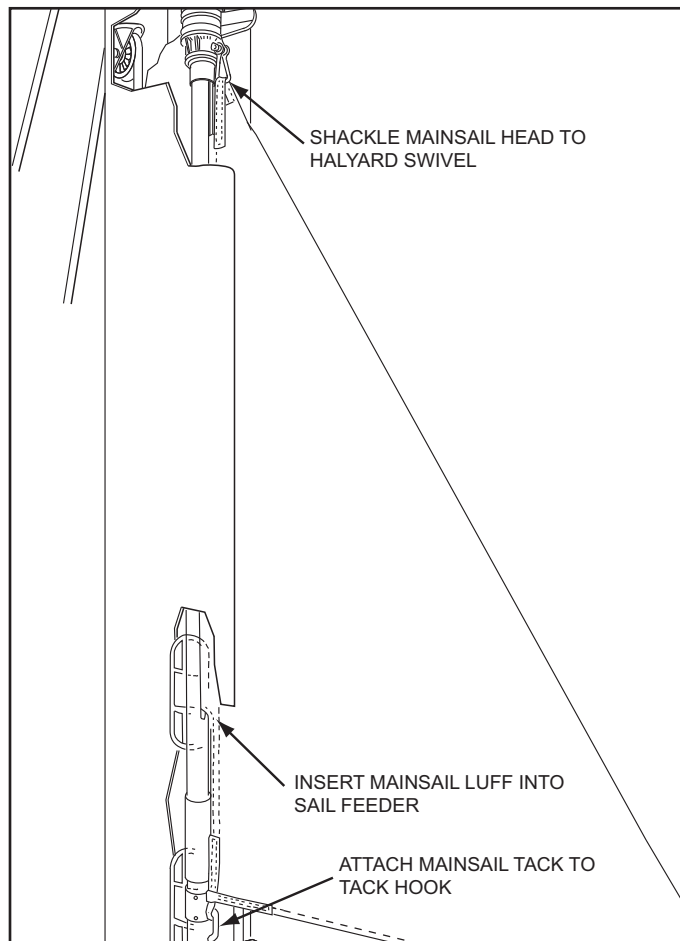


Figure 12.6



### 12.7.11 Jib Furler And Sail Installation

The jib furler (Fig. 12.8) will be assembled by your dealer during the commissioning process. Depending on your purpose, removing or reinstalling the jib furler simply involves detaching it from the upper mast and stem plate (see Stepping the Mast above for details on stepping the mast with the jib furler attached).

Please refer to the jib furler manufacturer's OEM manual for details on assembling, disassembling, adjusting and maintaining the furling system as well as jib installation.

Once the furler and jib are assembled, raised and furled, verify or route the jib sheets as described in the Running Rigging section above (see Fig. 12.24 for overall layout). Finally, verify or route the jib furling line as described in the Running Rigging section above.

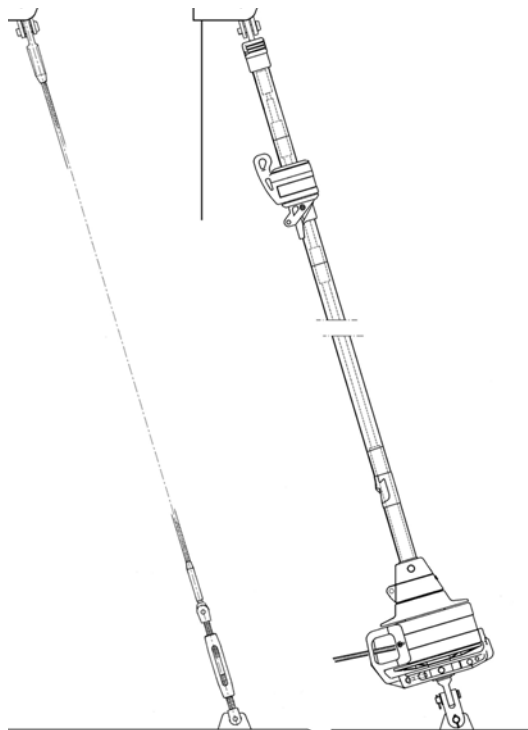


Figure 12.8

### 12.7.12 Spinnaker Installation

Refer to Fig. 12.25 for the spinnaker layout.

1. Attach the single block to the forward facing eye of

## Sails and Rigging

the stem plate.

2. Attach the tack line to the spinnaker tack and route it through the block and cleat it off on the forward port cleat.
3. Attach the halyard to the head ring of the sail.
4. Attach a sheet to the clew ring of the spinnaker and ensure the line is led aft outside the shroud and lifelines to a stand-up block just aft of the arch legs.
5. Run it to the helm winch allowing total slack in the sheet.
6. The sheet that is not being used, the lazy sheet, should also be attached to the clew of the spinnaker and led forward in front of the headstay, and then back on the other side of the boat, outside the shroud and lifelines, to another stand-up block positioned just aft of the arch legs.
7. Take that sheet and lead it to a winch, leaving some slack.

### 12.7.13 Retuning the Mast

The final step is to check your settings by sailing in 10-15 knot winds (see the Getting Started chapter in this manual for details on an initial excursion):

1. Sail upwind and check if the shrouds on the leeward side are slack. If so, tighten them to remove approximately half the slack - keep track of the number of turns.
2. Tack and repeat for the other side.
3. Continue until you are satisfied with the tension where the leeward side does not get loose when the boat is heeled.
4. Sight up the mast and verify it is still straight from side to side and adjust the appropriate rigging to correct, if necessary. (Keep in mind it is possible to over-tighten.)
5. Tension the jib furler/forestay by adjusting the forestay rigging screw (see jib furler manufacturer's OEM manual).
6. Ensure the mast is tuned to a 6" to 8" bend on the standard mast and 2" to 3" bend on the furling mast (discussed previous). Adjust the bend as required.

### 12.7.14 Rigging Review

Once the rig is tuned, you should make sure to add the cotter pins to all the rigging, bending back the ends and taping them to prevent snagged lines, sails, and fingers.

In general, tie figure eight knots in the end of sheets to prevent them from running back through the stoppers or cars.

## 12.8 Sail Reefing & Stowing

Reefing the sails reduces the area of the sails. This can improve the boat's stability and reduce the risk of damaging the sails or boat hardware in strong winds. Reefing is a subset of stowing the sails. In other words, stowing the sails fully reduces the sail area of the sails.

### 12.8.1 When to Reef

When determining your sail configuration, wind strength will be a key factor. Figure 12.9 provides apparent wind speed (AWS) levels and the suggested sail configuration. It is critical to maintain sail discipline at these levels for the safety of those on board and the protection of your vessel.

APPARENT WIND SPEED (AWS)	MAIN	HEADSAIL REEF
9	FULL	FULL
12	FULL	FULL
15	FULL	FULL
17	1ST REEF	FULL
19	1ST REEF	1ST REEF
23	2ND REEF	2ND REEF
MODERATE GALE	2ND REEF	3RD REEF
GALE	NO MAIN	4TH REEF

Figure 12.9

As a rule of thumb, consider reefing whenever the boat heels to 22 degrees or more (an inclinometer will assist in determining the degree of heel).

**NOTE:** Excessive sail area or modifications to the original sail and/or rig design can cause unsafe conditions including knock-down/broach.

**NOTE:** The wind strengths tabulated above include a margin for the effects of gusts. If violent winds or confused or breaking seas exist, additional caution should be exercised.

**NOTE:** Remember:

1. In the event of a severe gust, FREE SHEETS;



## Sails and Rigging

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2. *If wind is closehauled, LUFF UP;*
3. *If wind is abeam, FREE SHEETS;*
4. *If wind is abaft the beam, BEAR AWAY.*

*NOTE: Special care should be taken when turning from a following wind onto a beam reach, because both the apparent wind speed and heeling effect will increase. Such turns should not be made rapidly, and consideration should be given to a reduction in sail before such a maneuver.*

It can not be stressed enough, that vigilance, common sense and a cautious mindset will be strong allies for safe sailing. The forces of nature can and will be unpredictable at times and your sail configuration will be a central factor on sailing success or disaster in response to these forces. Always err on the side of caution.

### 12.8.2 Conventional Mainsail

The standard rig comes with a dual-line reefing system on the conventional mainsail. The decrease of sail area is vertical, or the foot shifts up on the sail to the new reefing point. Stowing the sail involves lowering the sail to the boom and lashing it down, wrapping it with a sail cover or lowering it into an encasing sail cover.

#### 12.8.2.1 Reefing System Installation Instructions

Installation of your reefing system involves the following steps:

1. Run both reefing lines as illustrated in the Generalized Reefing Layout illustration (Fig 12.26). The shorter reef line will be used on the first reef (starboard side, white w/ green flecks). The longer reef line will be used on the second reef (port side, white w/ red flecks).
2. Ease the mainsheet.
3. Lower the mainsail to approximately the first reef position.
4. Take up the slack in the first reef line until the tack and the clew are down to about 2" above the boom.
5. Adjust the main halyard so that the tack reef point is not contacting the goose neck and is applying tension to the luff of the main above the reef, not below. There should be approximately 6" (150mm) of stretch in the main luff when the reefing line is tensioned, so, ensure this is considered when adjusting the main halyard to locate the tack reef.
6. Confirm that the tack reef point is still clear of the

tack shackle and that only the main luff above the reef cringle is tensioned, not the luff below the cringle. Ease the reef line and readjust the halyard if necessary.

7. After the halyard has been stretched, mark it at the stopper with a 1" (25mm) single band of indelible marker ink. By dropping the halyard to this mark every time, positioning is made easier. The halyard is automatically in the correct position for the reef. Similarly, mark the reef line in the same fashion for a consistent correct position.
8. Repeat the procedure for the second reef, using double bands to mark the halyard and reef line in the correct position.

#### 12.8.2.2 Reefing Instructions

1. Head up into the wind.
2. Ease the mainsheet.
3. Check the topping lift for adequate boom support.
4. Lower the main halyard to the appropriate mark and snub the line with the stopper.
5. Tension the reefing line with the self-tailing winch until the reef clew is brought down to the boom. Apply stopper and tension the main halyard back up, ease the topping lift (if needed).

#### 12.8.2.3 Shaking out a Mainsail Reef Instructions

1. Head up into the wind.
2. Ease the mainsheet.
3. Release the line stopper and remove reef line from winch.
4. Tension the main halyard to raise sail, making sure reef lines run freely while sail is being raised. Apply stopper to main halyard.
5. Re-tension mainsheet, ease the topping lift (if needed).

#### 12.8.2.4 Stowing the Mainsail

Stowing the mainsail involves lowering it fully to the boom and lashing it down. Lowering the mainsail is assisted and simplified by lines termed lazy jacks. This element of running rigging consists of a network of lines attached to a point on the port and starboard upper spreaders to a

## Sails and Rigging

series of connections on either side of the boom. These lines form a cradle which helps provide an organized folding as the mainsail is lowered.

However, given the negative impact of UV rays on sails, it is recommended to cover the lowered mainsail. Hunter offers an optional stack-pack sail cover. This sail cover is installed within a groove on the boom top and is opened up to receive the lowered sail and closed and zipped for stowing. The sail cover is integrated with the relevant running rigging. The reef lines pass through the sail cover through small slits which allow line movement. The lazy jack system can be attached to the sail cover. Review Figures 12.27 and 12.28 for details on the lazy jack and sail cover layouts and installation instructions.

### 12.8.3 In-Mast Furling Mainsail

The optional in-mast furling rig comes with an infinite reefing system. Sail area is decreased horizontally, or the luff shifts to the right on the sail. Stowing the sail involves furling it within the mast through the roller furling mechanism. Reefing and stowing the roller-furling mainsail is accomplished by the opposing main furling line and mainsail outhaul line.

#### 12.8.3.1 Furling Instructions

1. Ensure the vang is sufficiently slackened.
2. Ensure the leech is freed up by adjusting the topping lift as required.
3. Take up the main furling line while keeping slight tension on the outhaul; continue to furl until only the UV protected portion of the sail is visible (Fig. 12.10).

#### 12.8.3.2 Reefing Instructions

1. Ensure the leech is freed up by adjusting the topping lift as required.
2. Set the reefing winch setting to “FREE”.
3. Take up the main furling line while keeping slight tension on the outhaul line.
4. When reaching a desired reef point, mark the main furling line at the stopper with a 1” (25mm) single band of indelible marker ink. By taking up the main furling line to this mark every time, consistent positioning is made easier. Similarly, mark the outhaul line in the

same fashion for a consistent correct position.

5. Repeat the procedure for the second desired reef point, using double bands to mark the main furling line and outhaul in the correct position.

#### 12.8.3.3 Unfurling Instructions

1. Ensure the vang is sufficiently slackened.
2. Free up the main furling line.
3. Take up the outhaul line while providing backtension on the main furling line (to avoid line gnarling)



Figure 12.10

### 12.8.4 Roller Furling Jib

Control of the headsail sail area is also through a roller furling system and, hence, an infinite reefing system. Stowing the headsail involves furling it within its roller furling mechanism.

#### 12.8.4.1 Furling Instructions

1. Ensure the windward sheet is running freely.
2. Take up the furling line while slightly releasing the leeward sheet. Keep some tension on the sheet to allow a tight and even furl (Fig. 12.11).
3. Tie the furling line to the starboard cleat.

#### 12.8.4.2 Reefing Instructions

Same as the furling instructions.

### 12.8.4.3 Unfurling Instructions

1. Release the furling line and windward sheet.
2. Place a turn of the furling line around the cleat or winch to produce some drag.
3. Place a turn of the leeward sheet around a winch and unfurl the sail by drawing in the sheet.
4. Place a few more turns of the sheet around the winch.

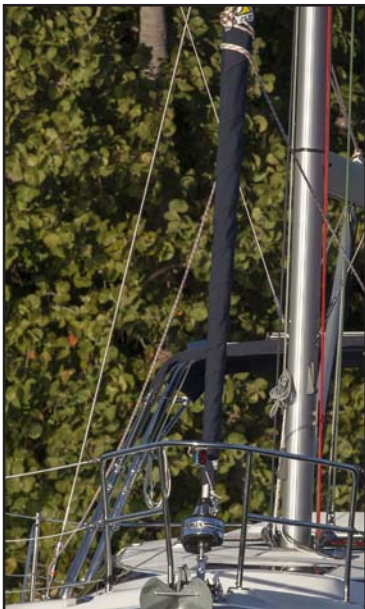


Figure 12.11

## 12.9 Supporting Hardware

Please refer to the Boating Safety chapter in this manual for the deck hardware layout illustration.

### 12.9.1 The Traveler/Tracks

The mainsheet traveler is located overhead on the arch. The traveler provides controls on the range of motion for end boom sheeting. The helmsman can easily adjust the mainsheet traveler, the jib sheets, and the mainsheet (see Fig. 12.21 and 12.22). The setup allows short handed sailing with only a couple of people in the cockpit or with autopilot steering.

These tracks allow cars to travel forward and aft providing control on the range of motion for the jib to be able to adjust the lead position.

### 12.9.2 Winches

The winches (Fig. 12.12) perform the heavy lifting with working sails. They provide the extra purchase needed when trimming. Your boat comes standard with 2 coach roof self tailing manual winches and 2 cockpit self tailing manual winches. Two manual winch handles are included in loose gear. Marlow-Hunter offers optional electric self tailing winches as an upgrade. Rather than hand cranking the winch, one simply activates the winch by depressing the winch power button (Fig. 12.13) located in close proximity to the winch.

Self tailing winches allow winching by one person rather than two. Generally, standard winches would require one person to winch and another to pull the “tail”. The self tailing method involves a feeder arm which guides the line into a groove in the crown of the winch. When winching, the line rotates around to the feeder arm which then redirects it off the winch.

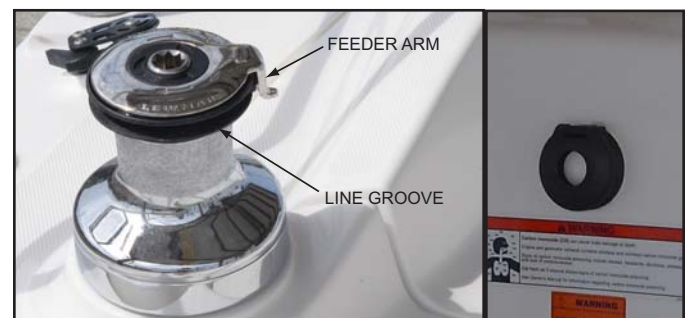


Figure 12.12      Figure 12.13

### 12.9.3 Blocks, Jammers and Organizers

The rigging is facilitated by a number of blocks (or pulleys) of various designs, line jammers and line organizers. These are all intended to organize the running rigging to allow cockpit control of the sailing experience.

### 12.9.4 General Hardware Maintenance

Check all fittings regularly to be sure screws are tight. Occasionally lubricate (100% silicone spray) all moving parts on hardware such as blocks, turnbuckles, cam cleats, track slides, etc.

Inspect cleat and fairleads for roughness. Smooth with fine-grained emery paper if necessary. Also, replace any missing or damaged cotter pins in turnbuckles and shackles. Tape them or use protective covers manufactured for that purpose. Grease winches a minimum of once annually.

## GENERAL RIG COMPONENTS

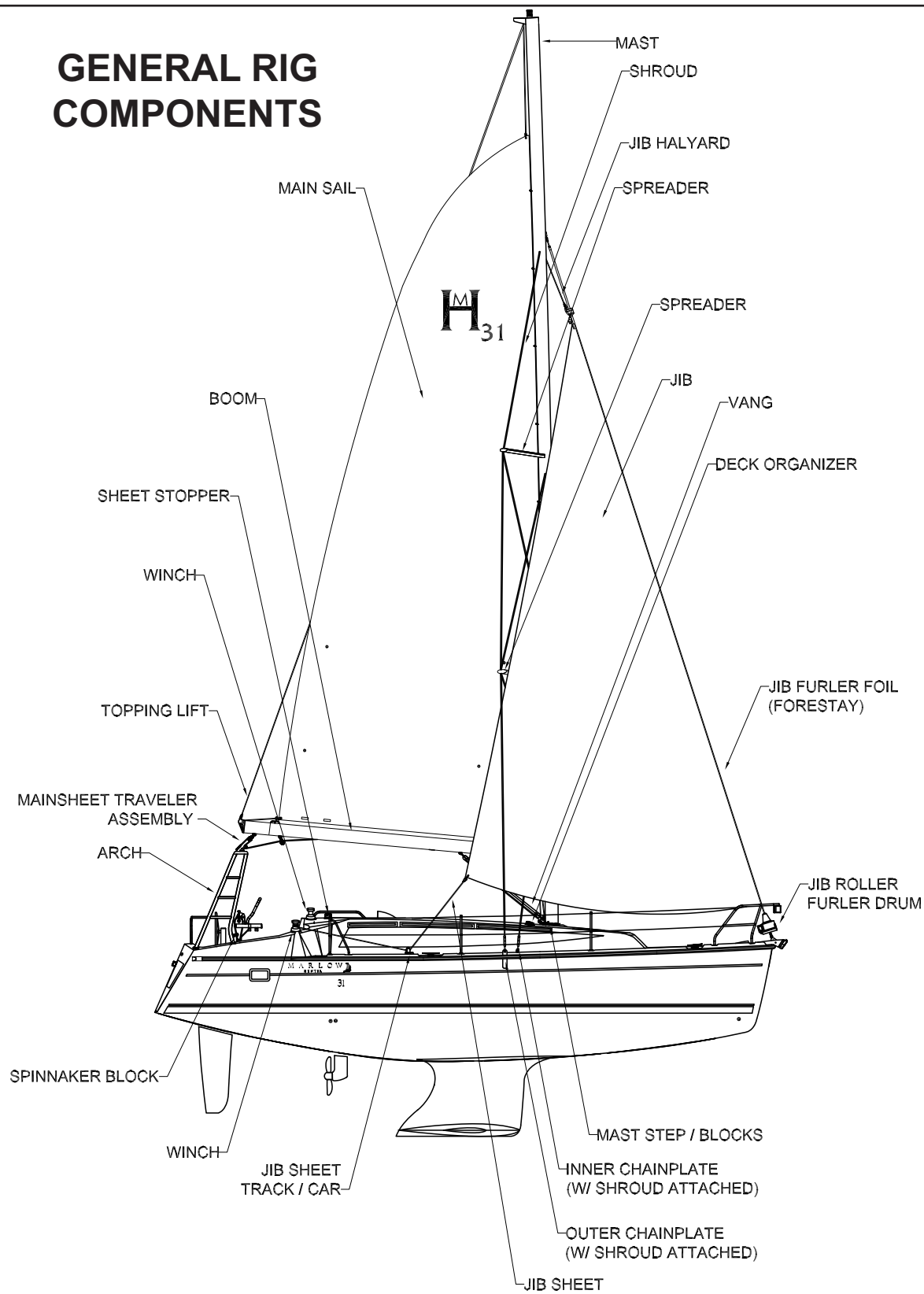


Figure 12.14

## MAINSAIL / JIB SPECIFICATIONS

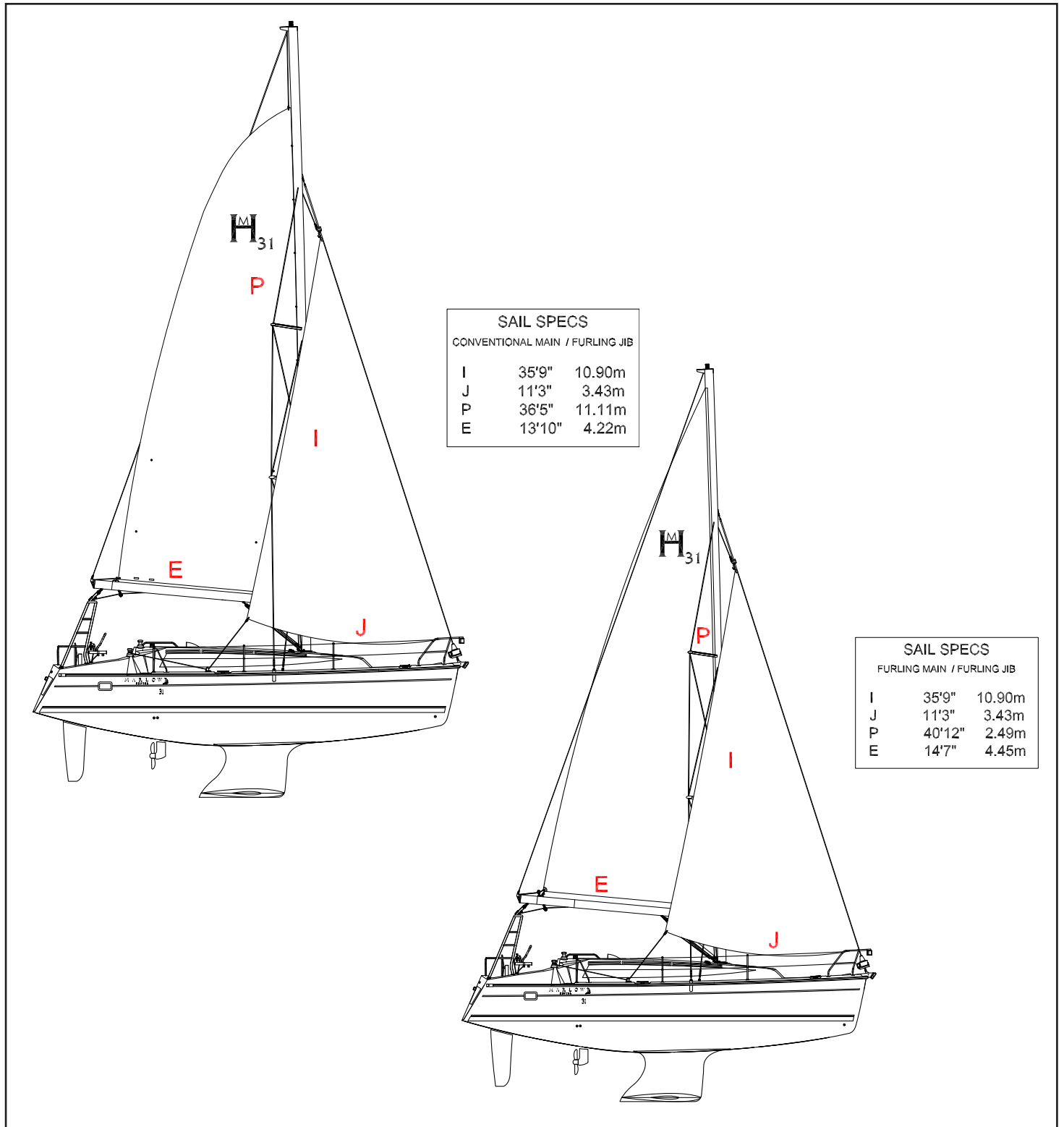
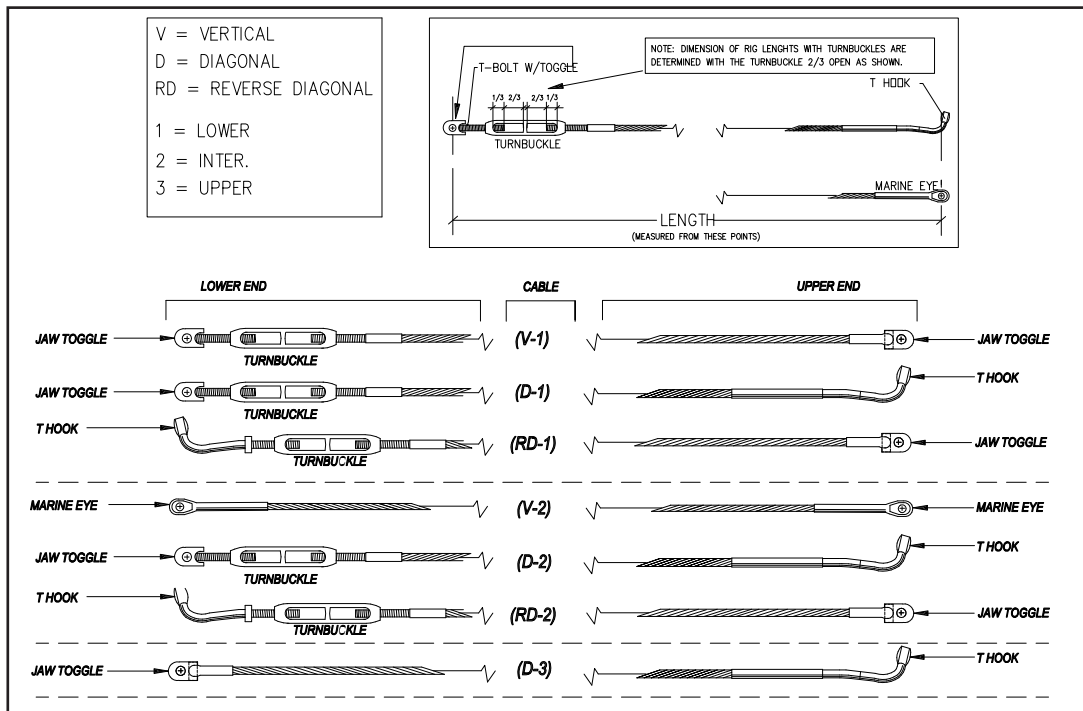


Figure 12.15

## STANDING RIGGING SPECIFICATIONS

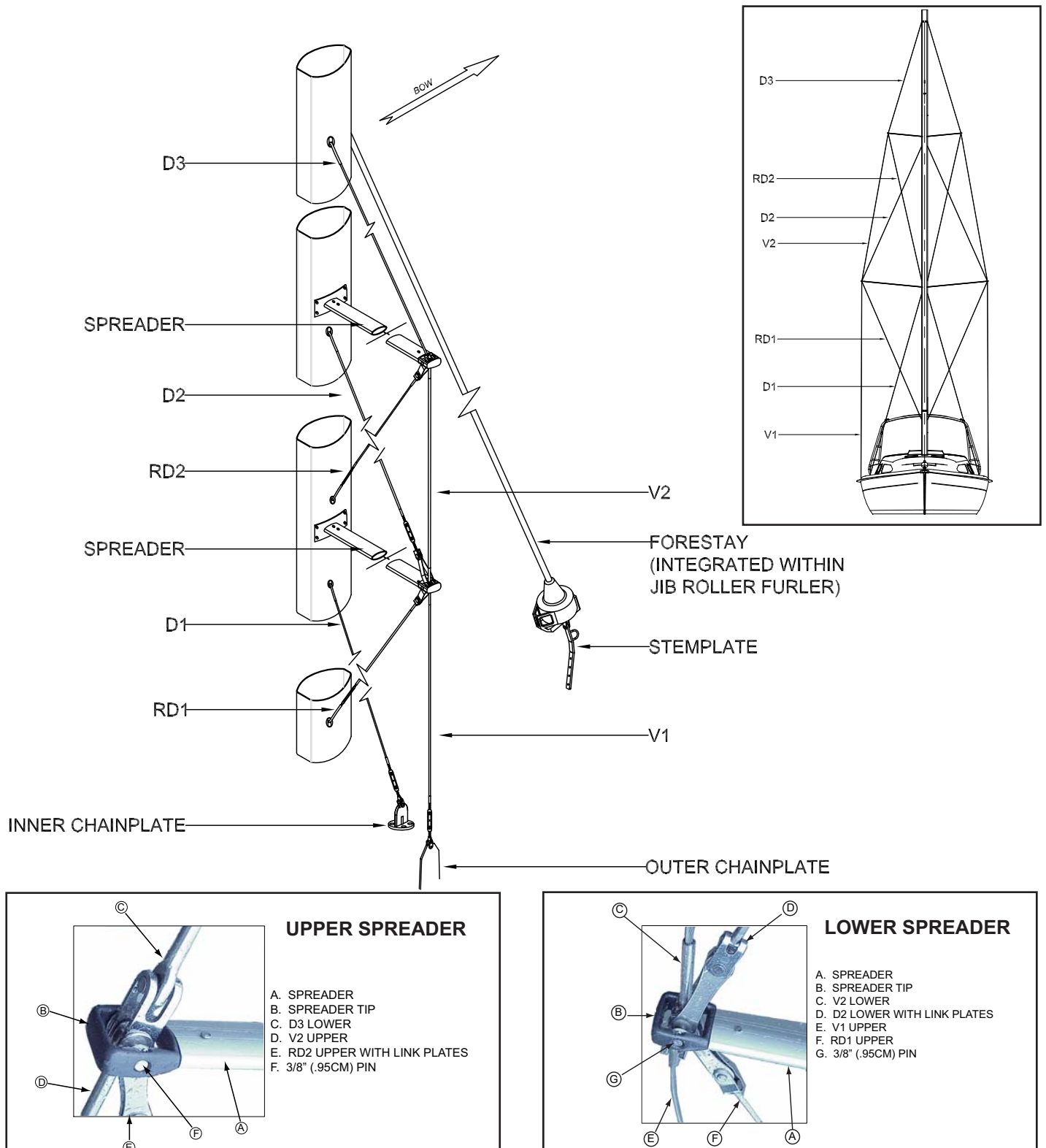
### STANDARD & FURLING RIGS



#	ITEM	QTY	WIRE SIZE	FITTINGS	CP-CP OR CP-EOS
1	FORESTAY	1	1/4" 6 mm	FURLEX 106-12 027-019-73	38' 2 1/2" 11645 mm
2	D3	2	1/4" 6 mm	T-TERMINAL 308-324 FORK 308-417	14' 1/2" 4280 mm
3	V2	2	3/8" 6 mm	EYE 308-304 EYE 308-304	11' 2" 3405 mm
4	D2	2	3/16" 5 mm	T-TERMINAL 308-323 STD/FRK TB 174-322-06	10' 3 3/4" 3145 mm
5	RD2	2	5/32" 4 mm	FORK 308-312-01 STD/T TB 174-322-21	10' 9 1/2" 3290 mm
6	V1	2	9/32" 7 mm	FORK 308-315-01 STD/TGLE TB 174-324-0	12' 10 3/4" 3930 mm
7	D1	2	9/32" 7 mm	T-TERMINAL 308-325 STD/TGLE TB 174-324-40	12' 5/8" 3675 mm
8	RD1	2	5/32" 4 mm	FORK 308-312-01 STD/T TB 174-3222-21	8' 6 3/4" 2610 mm
SELDEN MAST SRIG-0248					

Figure 12.16

# STANDING RIGGING LAYOUT STANDARD & FURLING RIGS



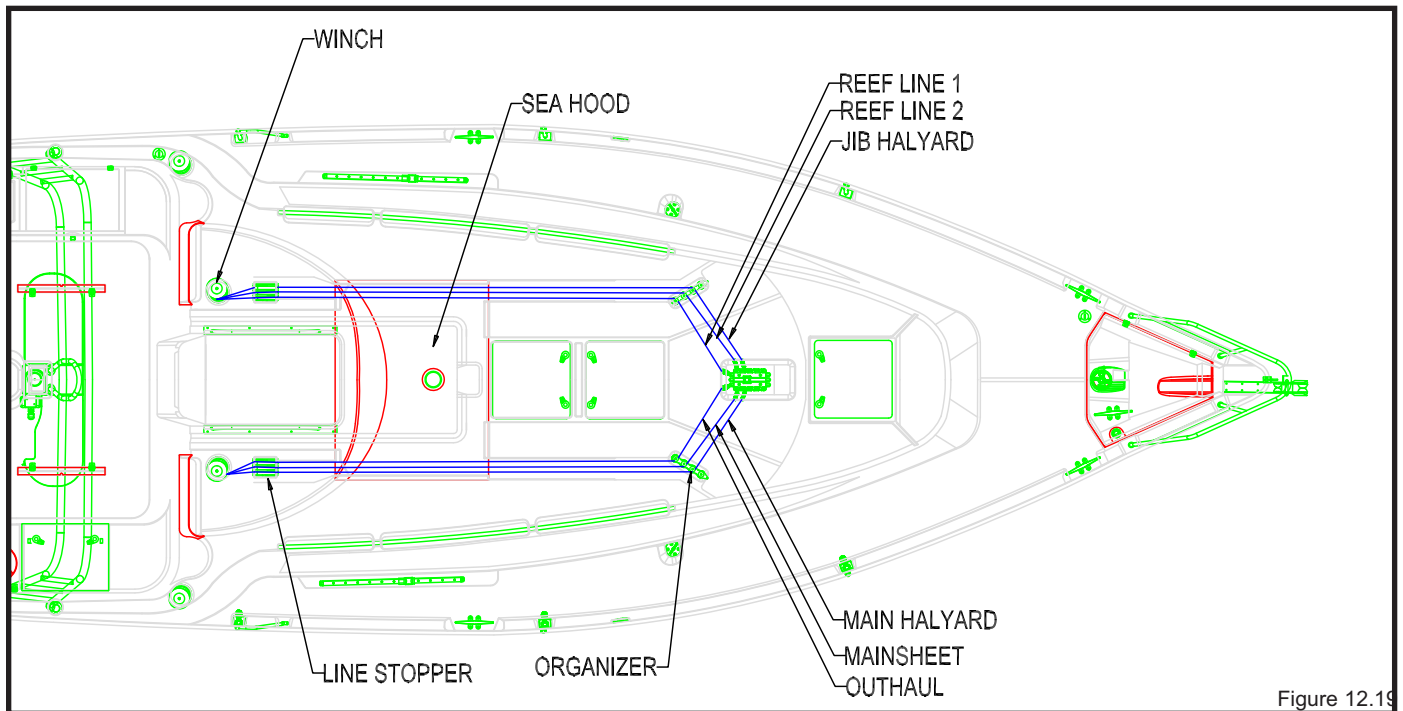


# RUNNING RIGGING SPECIFICATIONS

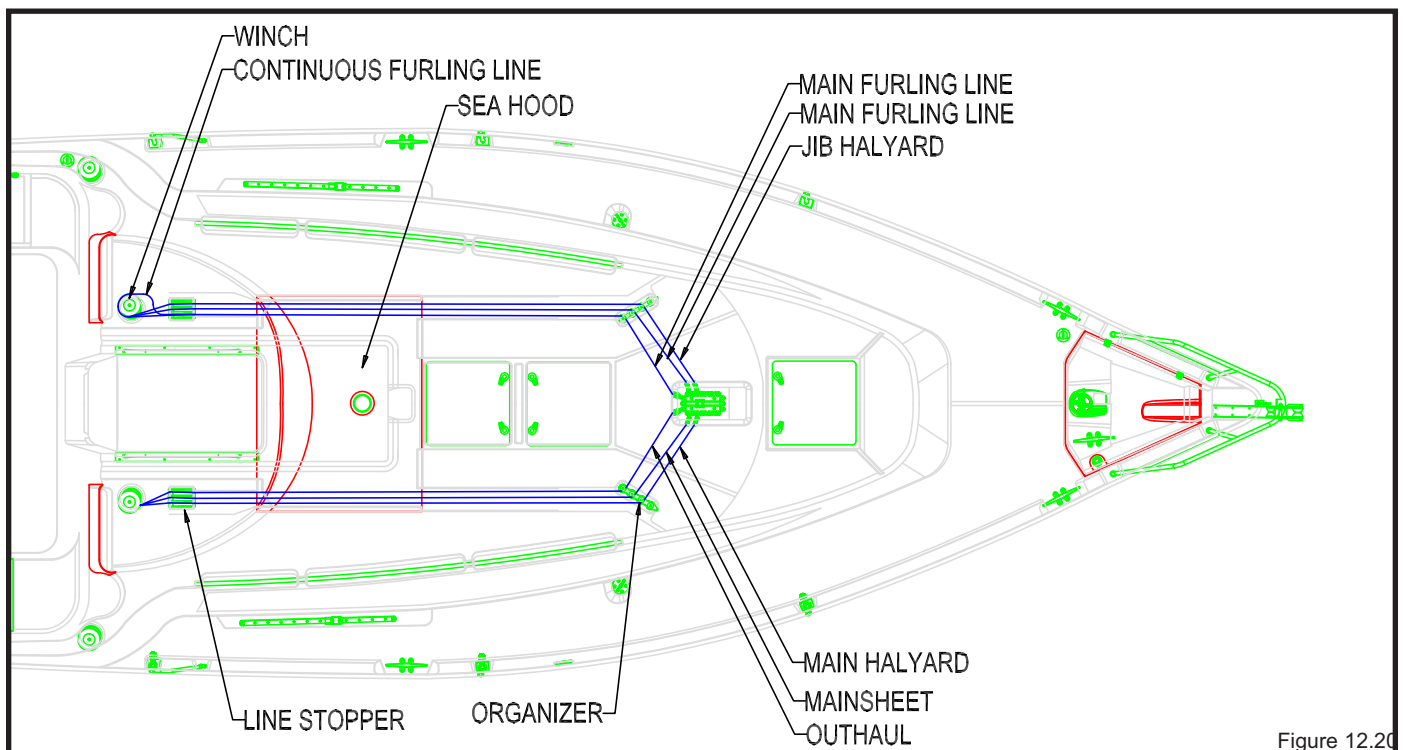
#	OPT/STD	ITEM	QTY	SIZE/IN	SIZE/MM		COLOR	TOP	BOTT	LENGTH/FT	LENGTH/M	SHIPPED
1	STD	MAIN HALYARD	1	3/8	10	32 PLAIT POLYESTER	NAVY BLUE	BARE	BARE	105.0	32.0	W/ MAST
2	STD	MAINSHEET	1	3/8	10	16 PLAIT POLYESTER	WHITE <small>W/ BLUE TRACER</small>	BARE	BARE	101.7	31.0	W/ STAND RIG
3	STD	TRAVELER LINES	2	5/16	8	32 PLAIT POLYESTER	WHITE	BARE	BARE	26.2	8.0	W/ STAND RIG
4	OPT	MAIN FURLING LINE	1	3/8	10	32 PLAIT POLYESTER	WHITE <small>W/ YELLOW TRACER</small>	CONT	CONT	42.7	13.0	W/ STAND RIG
5	STD	TOPPING LIFT	1	5/16	8	32 PLAIT POLYESTER	WHITE <small>W/ BLUE TRACER</small>	BARE	8MM SHACKLE	101.7	31.0	W/ MAST
6	STD	BOOM OUTHAUL	1	3/8	10	32 PLAIT POLYESTER	WHITE <small>W/ RED TRACER</small>	BARE	BARE	59.1	18.0	W/ BOOM
7	STD	VANG TACKLE	1	3/8	10	32 PLAIT POLYESTER	BLACK	BARE	SMALL EYE	36.0	11.0	W/ VANG
8	OPT	SOLID VANG LINE	1	3/8	10	32 PLAIT POLYESTER	BLACK	BARE	SMALL EYE	36.0	11.0	W/ SOLID VANG
9	STD	REEFING LINE #1	1	3/8	10	16 PLAIT POLYESTER	WHITE <small>W/ GREEN TRACER</small>	BARE	BARE	78.7	24.0	W/ STAND RIG
10	STD	REEFING LINE #2	1	3/8	10	16 PLAIT POLYESTER	WHITE <small>W/ RED TRACER</small>	BARE	BARE	108.3	33.0	W/ STAND RIG
11	STD	JIB HALYARD	1	3/8	10	32 PLAIT POLYESTER	RED	BARE	8MM SHACKLE	88.6	27.0	W/ MAST
12	STD	JIB SHEET	2	1/2	12	16 PLAIT POLYESTER	WHITE <small>W/ RED TRACER</small>	BARE	BARE	46.0	14.0	W/ STAND RIG
13	STD	JIB FURLING LINE	1	5/16	8	32 PLAIT POLYESTER	WHITE <small>W/ BLACK TRACER</small>	BARE	BARE	65.6	20.0	W/ FURLEX
14	OPT	SPINNAKER HALYARD	1	3/8	10	32 PLAIT POLYESTER	BLACK	BARE	SNAP SHACKLE	108.0	33.0	W/ SPIN OPT
15	OPT	SPINNAKER TACK LINE	1	3/8	10	16 PLAIT POLYESTER	WHITE	BARE	2" LOOP	16.0	5.0	W/ SPIN OPT
16	OPT	SPINNAKER SHEET	2	1/2	12	16 PLAIT POLYESTER	WHITE	BARE	BARE	72.2	22.0	W/ SPIN OPT
17	STD	LAZY JACK LINE WIRE	2	5/32	4		WHITE <small>W/ PTFE COATING</small>	BARE	SHACKLE	9.8	3.0	W/ STAND RIG
18	STD	LAZY JACK LINE - FIXED	2	3/8	10	32 PLAIT POLYESTER	WHITE	BARE	BARE	16.4	5.0	W/ STAND RIG
19	STD	LAZY JACK LINE - ADJUSTABLE	2	3/8	10	32 PLAIT POLYESTER	WHITE	BARE	NYLON THIMBLE EYE	9.8	3.0	W/ STAND RIG

Figure 12.18

## RUNNING RIGGING LINES FROM MAST STEP / STANDARD RIG



## RUNNING RIGGING LINES FROM MAST STEP / FURLING RIG



## MAINSHEET & BOOM OUTHAUL LAYOUT

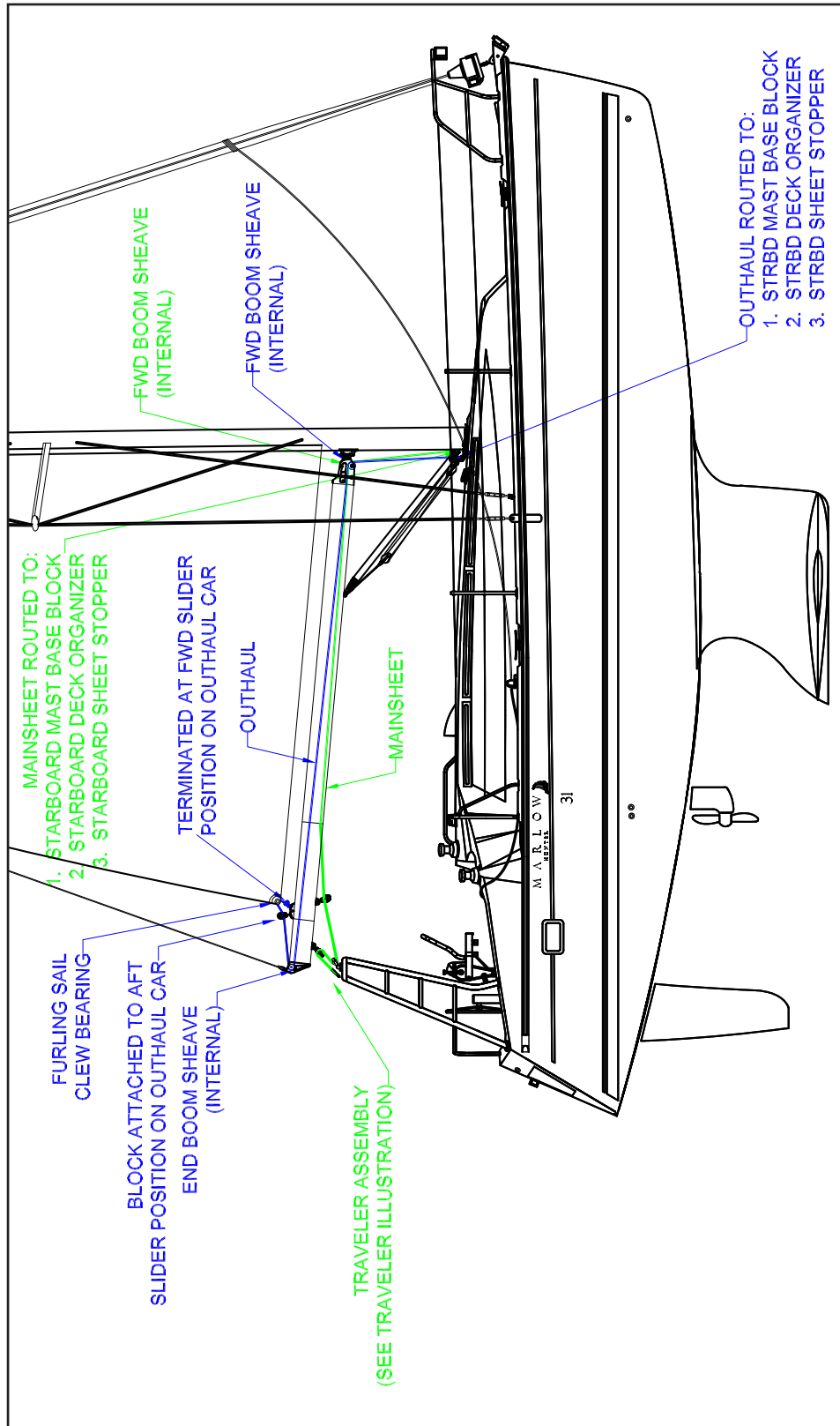


Figure 12.21

# MH31 TRAVELER LINES LAYOUT (WITH MAINSHEET)

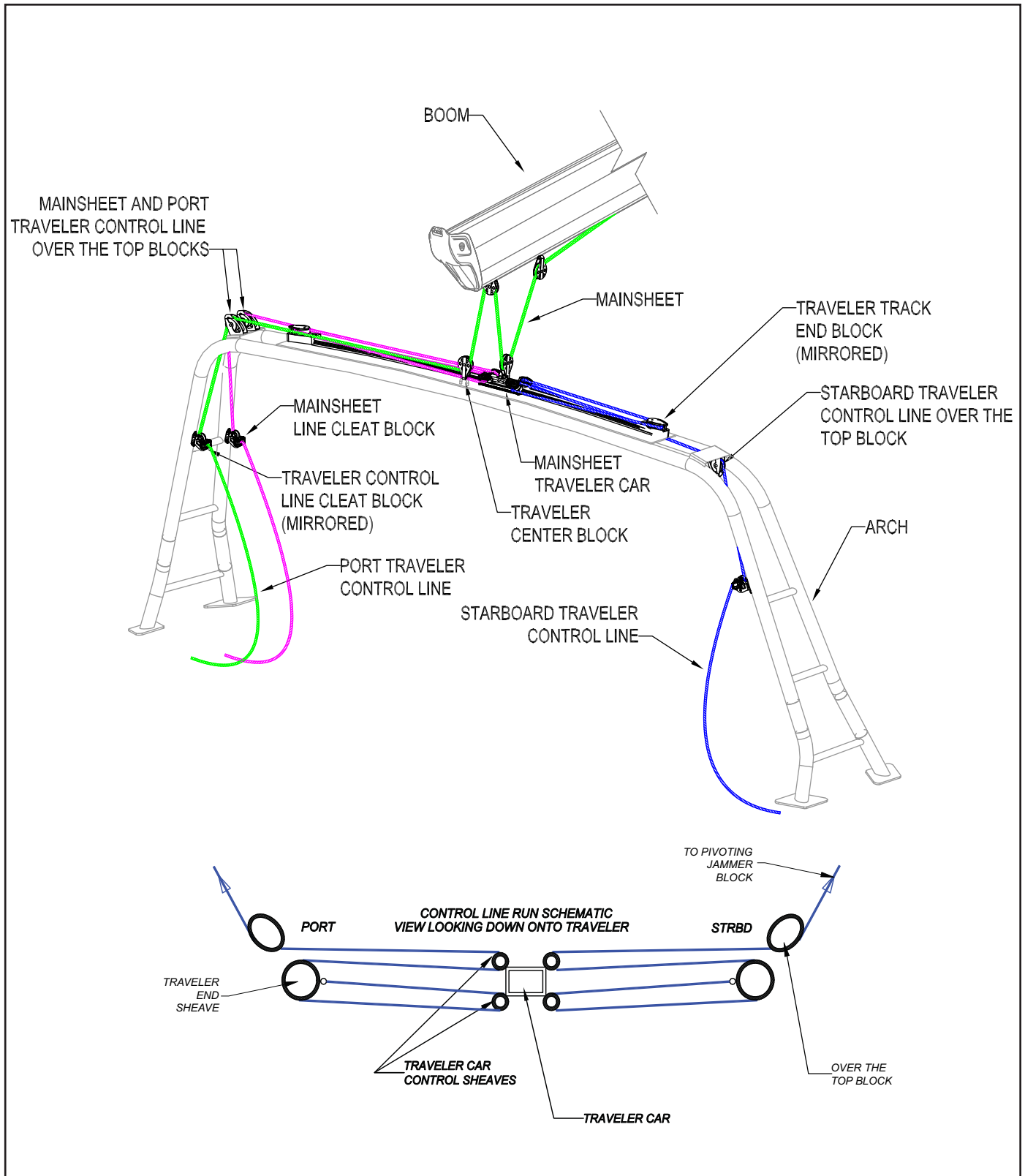
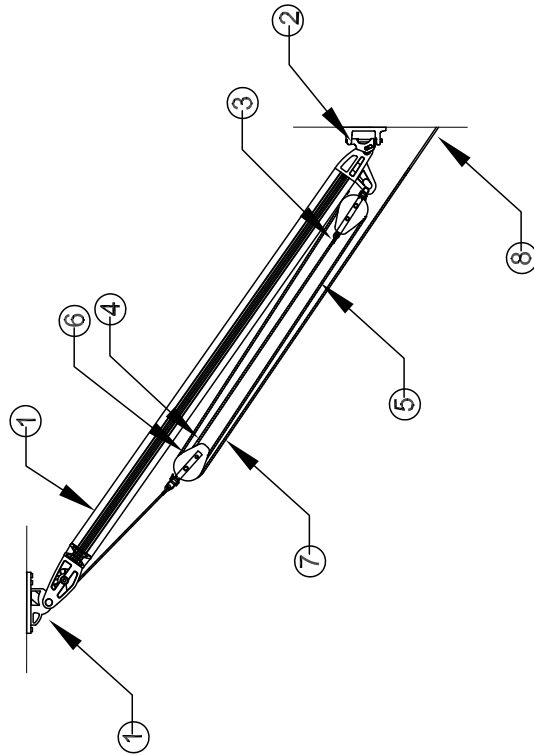


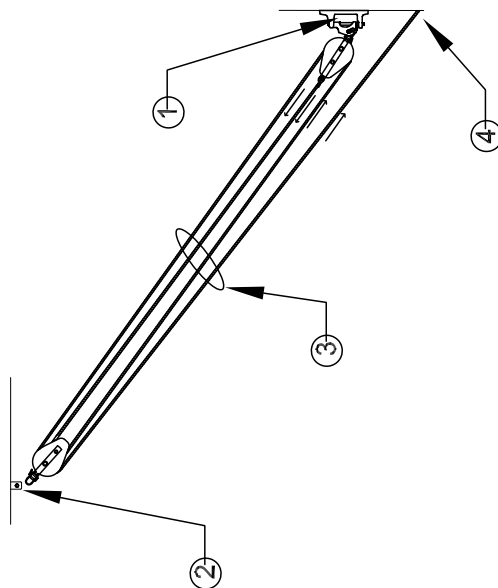
Figure 12.22

## VANG LAYOUT (CONVENTIONAL & SOLID)



### SOLID VANG INSTALLATION:

1. SHACKLE THE VANG END CAP WITH LARGER TUBE TO VANG BLOCK ON THE BOOM (ENSURE THE VANG IS ORIENTED SO THAT THE LINE EXITING THE LAST SHEAVE IS DIRECTED DOWN)
2. SHACKLE THE VANG END CAP WITH SMALLER TUBE TO VANG TOGGLE ON THE MAST
3. ROUTE THE VANG LINE KNOTTED TO LOWER BLOCK BECKET
4. TRAVEL UP TO THE UPPER DOUBLE BLOCK AND ROUTE AFT AROUND THE LOWER SHEAVE
5. TRAVEL DOWN TO THE LOWER BLOCK AND ROUTE FWD AROUND THE SHEAVE
6. TRAVEL UP THE UPPER DOUBLE BLOCK AND ROUTE AFT AROUND THE UPPER SHEAVE
7. ROUTE DOWN TO THE MAST BASE
8. TIE OFF AT THE MAST BASE



### ROPE VANG INSTALLATION:

1. ATTACH VANG LOWER FIDDLE BLOCK TO VANG TOGGLE ON MAST
2. ATTACH VANG UPPER FIDDLE BLOCK TO BAILE ON BOOM
3. ROUTE THE VANG LINE AS SHOWN
4. TIE OFF AT MAST BASE

Figure 12.23

## FURLING JIB LAYOUT

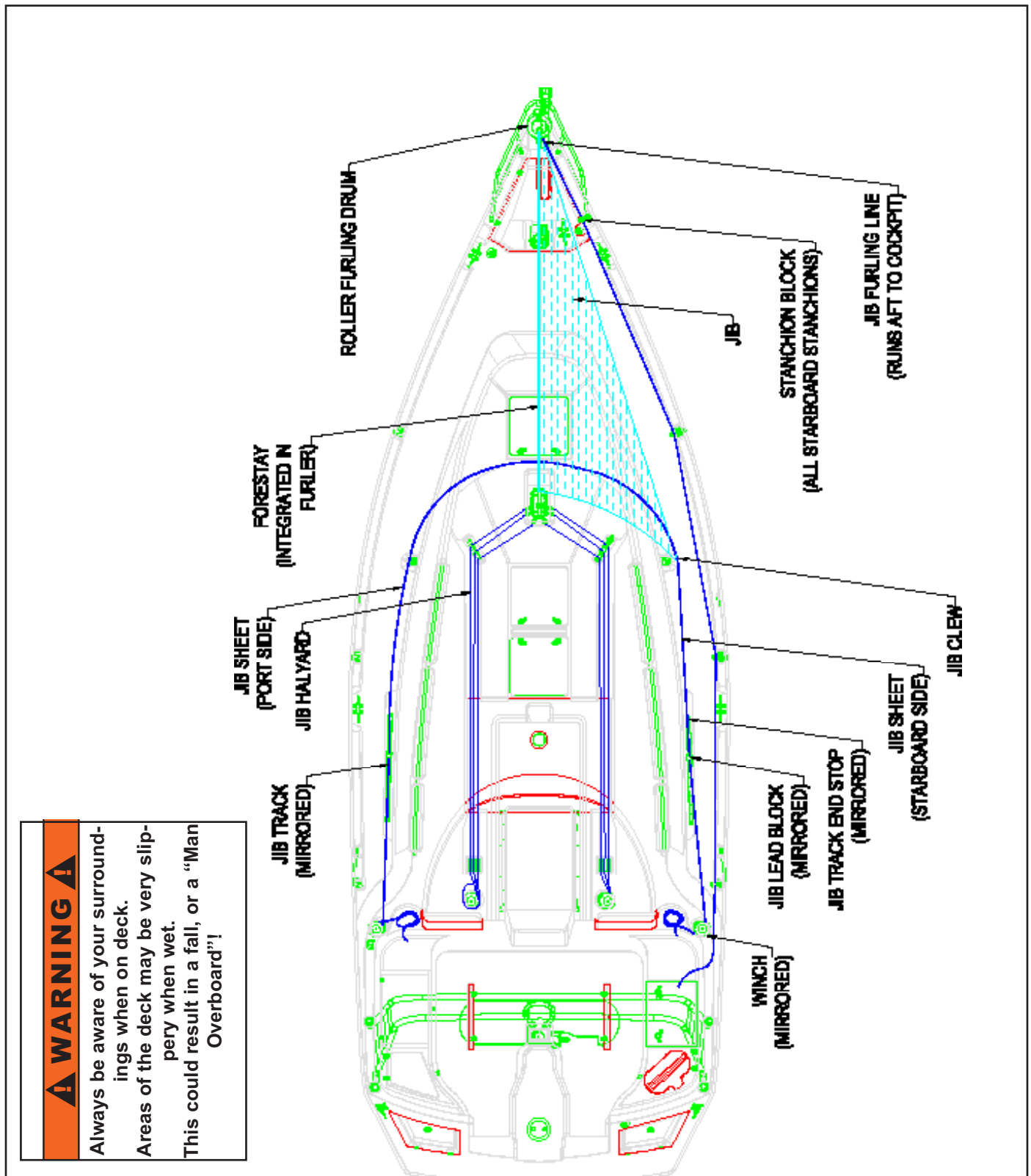


Figure 12.24

## SPINNAKER LAYOUT (OPTION)

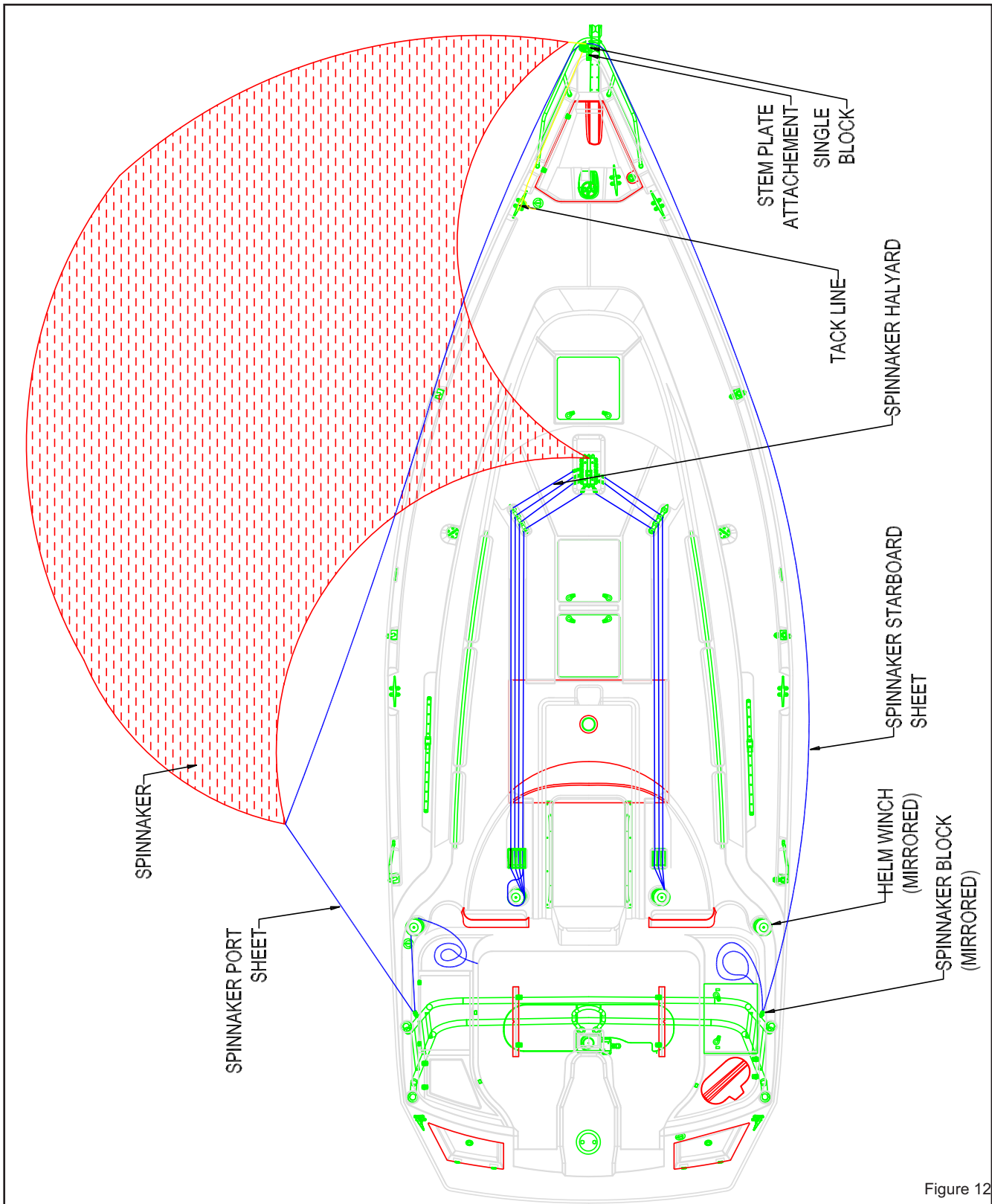


Figure 12.25



## GENERALIZED REEFING LAYOUT

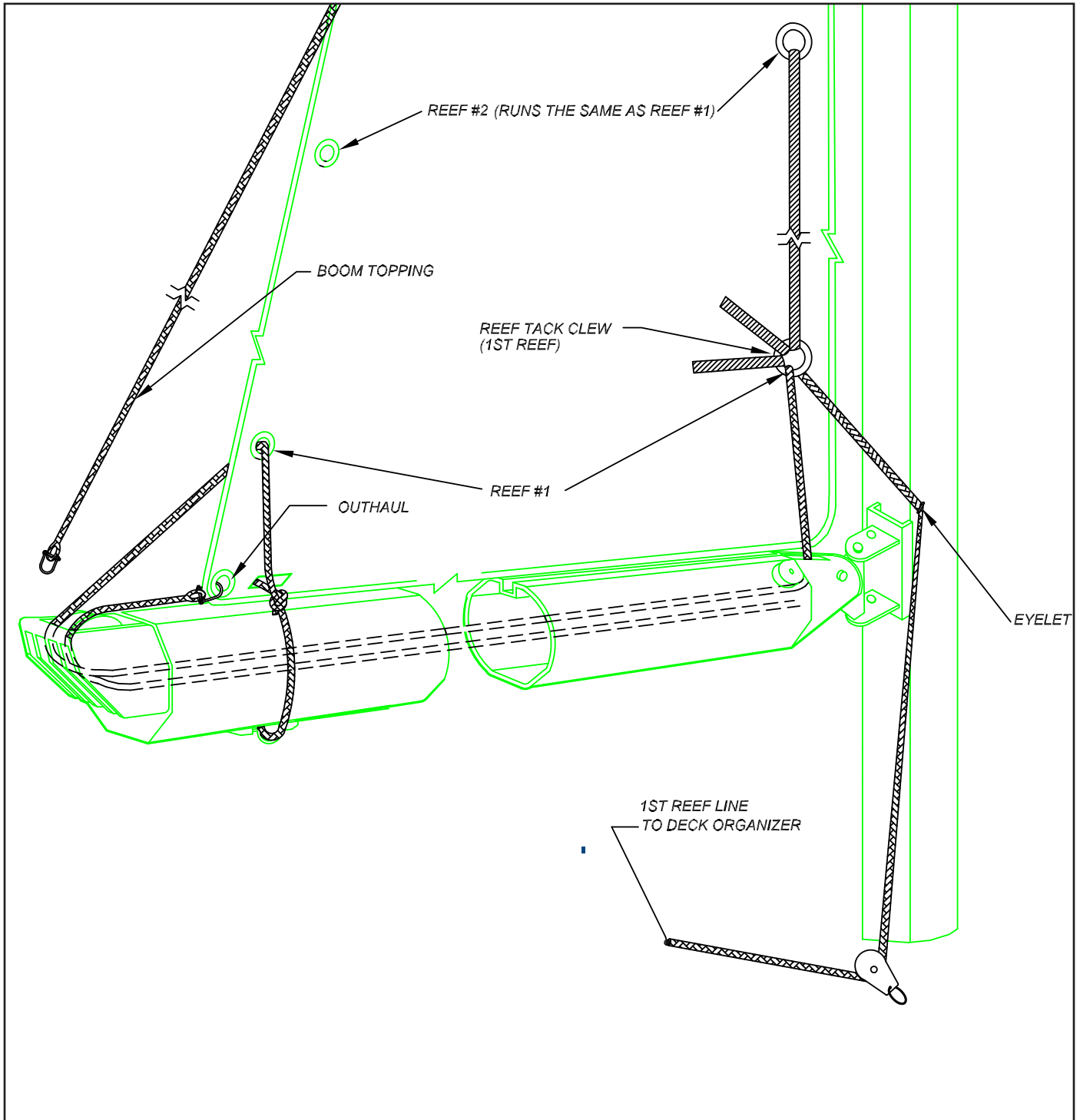
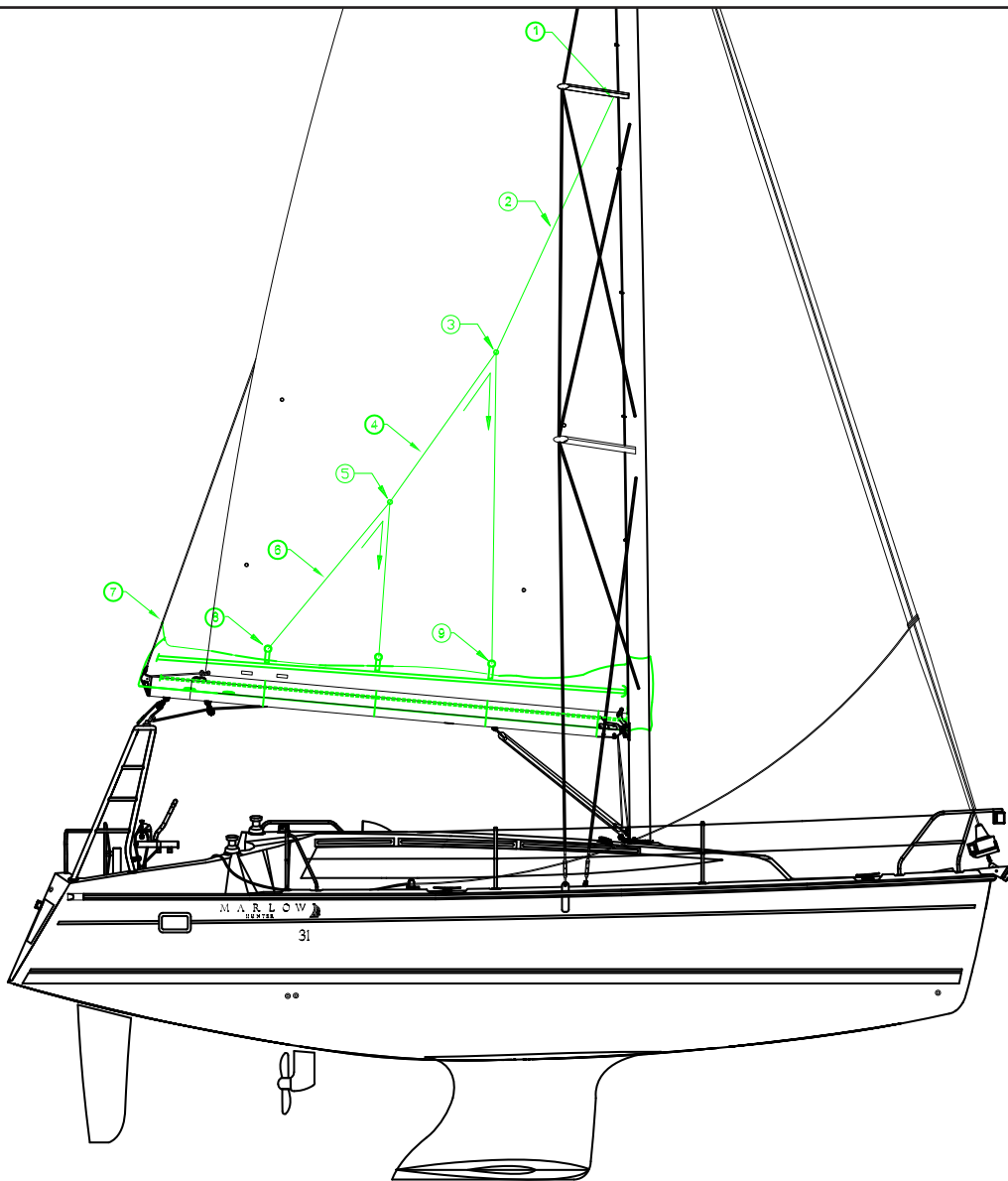


Figure 12.26

## LAZY JACK LAYOUT WITH OPTIONAL STACK-PACK SAIL COVER

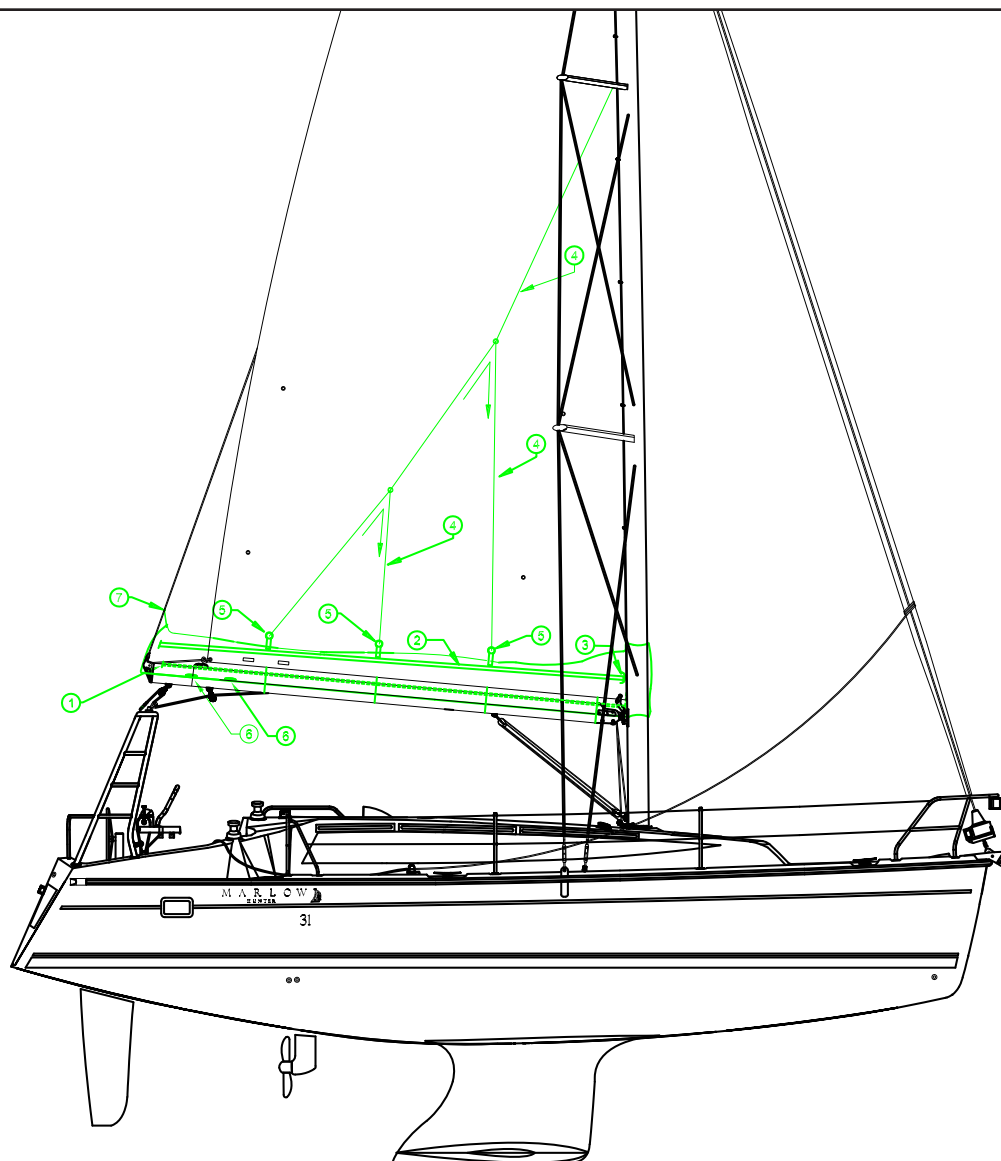


### LAZY JACKS LAYOUT:

1. LAZYJACK WIRE ATTACHMENT @ UPPER SPREADER (1)
2. LAZY JACK UPPER FIXED CABLE (2)
3. THIMBLE OR BLOCK ON FIXED CABLE (3)
4. FORWARD LAZY JACK LINE (THRU THIMBLE / BLOCK) (4)
5. LOWER THIMBLE (5)
6. AFT LAZY JACK LINE (THRU LOWER THIMBLE) (6)
7. AFT BALE (SECURE LAZY JACK LINE END) (7)
8. MID BALE (SECURE OTHER END OF AFT LAZY JACK LINE) (8)
9. FWD LAZY JACK LINE DEAD ENDS AT FWD STACK PACK STRAP (9)

Figure 12.27

## STACK-PACK SAIL COVER INSTALLATION WITH LAZY JACKS



### INSTALLATION INSTRUCTIONS:

1. SLIDE SAIL COVER BOLTROPE INTO CHANNEL (1) ON TOP OF BOOM - BEGINNING FORWARD AND CONTINUING AFT
2. INSERT PVC BATTENS (2) INTO THE SMALL FORWARD INSIDE POCKETS (3) ON EACH HALF OF THE SAIL COVER AND PUSH AFT UNTIL FULLY INSERTED
3. ROLL OR FOLD EACH SIDE OF THE MOUTH OUTWARD TO RECEIVE THE SAIL
4. TIE THE LAZY JACK LINES (4) TO THE THREE SAIL COVER EYE STRAPS (5)
5. RUN THE REEF LINES THROUGH THE COVER SLOTS (6) AND TIE OFF (BE SURE REEFING LINES ARE INSIDE OF SAIL COVER ZIPPER AT AFT END)
6. TIE LINE FROM AFT END EYELET OF SAIL COVER TO TOPPING LIFT (7)

Figure 12.28

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MARLOW-HUNTER, LLC

*Chapter 13*

# *Getting Underway*

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**H**aving been introduced to your boat and its systems, understood all relevant safety procedures and received training in seamanship, you are now ready to set sail. We will break the stages of your outing into the following categories:

1. Before Boarding
2. Boarding Your Boat
3. Starting the Engine
4. Getting Underway
5. Returning to Port
6. Emergency Operations

---

### 13.1 Before Boarding

---

Before you go on that first cruise, you should be able to answer “yes” to the following questions:

- Has your dealer completed the Pre-Delivery Service Inspection Report?
- Have you and your dealer signed the Pre-Delivery Service Inspection Report?
- Have you completed and emailed or mailed all applicable warranty registrations?
- Have you read and understood this operator’s manual and the OEM manuals?
- Has your boat been registered with the proper authorities?
- Does your hull display the proper identification?
- Has your dealer reviewed with you the operation of the boat and its systems?
- Has your dealer answered all your questions?

If you have taken care of these preliminary steps, you are ready to take your first cruise. Before you start, give some thought to the cruise itself. Choose a calm day if possible.

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### 13.2 Boarding your Boat

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Make it a routine to visually inspect the exterior of your boat every time you approach to board. Look for signs of damage that could be caused by the dock or other boats.

#### 13.2.1 Alarms

As you board your boat, you should listen for any alarms which could be sounding.

##### 13.2.1.1 High Water Alarm

The high water alarm in the cockpit will warn you of accumulating water in the bilges. Immediately investigate the source of this accumulation and take appropriate action.

##### 13.2.1.2 CO Detector Alarm

The CO detectors could indicate the presence of Carbon Monoxide gas. The dangers of Carbon Monoxide are detailed at length in the Boating Safety chapter of this manual.

Actuation of your CO alarm indicates the presence of carbon monoxide (CO) which will KILL YOU! If the alarm sounds:

1. Press the Test/Reset button.
2. Call Emergency Services.
3. Immediately move to fresh air, outdoors, or to an open window or door. Do a head count to check that all persons are accounted for. Do not reenter the premises nor move away from an open door or window until the emergency responders have arrived, the premises have been aired out, and your alarm returns to its normal operation.
4. After following steps 1, 2, and 3, if your alarm reactivates in a 24 hour period, repeat steps 1 – 3 and call a qualified appliance technician to investigate for sources of CO from fuel burning equipment and appliances, and inspect for proper operation of this equipment. If problems are identified during this inspection, have the equipment serviced immediately. Note any combustion equipment not checked by the service technician and contact the manufacturer directly for more information about CO safety and this equipment.



**The CO detectors will only indicate the presence of Carbon Monoxide at the sensor. Carbon Monoxide gas may be present in other areas.**

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## Getting Underway

*NOTE: There are other issues that could cause these alarms to sound, such as the loss of power in the batteries that feed the CO detectors and other systems. These alarms exist to warn of impending loss of function of these important systems.*

### 13.2.1.3 Engine Alarms

There are also alarms on your engine that could be sounding if the engine is running. Be sure and check your manufacturer's documentation for information concerning these alarms.

### 13.2.2 Strong Fuel Fumes



**Leaking fuel is a fire and explosion hazard. Personal injury or death could occur.**

Fuel fumes are heavier than air and can collect in the bilge area. These fumes are extremely hazardous. Perform a Fuel Safety Checklist For Boarding found in the Fuel System chapter in this manual. If you detect strong fumes, proceed as follows:

1. Evacuate all occupied enclosures immediately.
2. Shut down engine (if already operating).
3. Turn off all electrical circuits.
4. Inform the dock master. Have a qualified technician check the boat immediately to determine the source of the odor.
5. Open the boat for natural ventilation.
6. When you can no longer smell fumes, locate the source. Dispose of fuel in a safe, approved manner.



**Explosive fuel vapors can become trapped in the lower portions of the boat. Close all hatch covers, windows, doors, and compartments while fueling your boat.**

## 13.3 Starting the Engine

For convenience, some information is repeated here from the DC Electric System chapter of this manual (and other

sections). However, if you take the opportunity to review that chapter, it will assist your understanding and recollection of the following material.

To begin, first determine the source of your boat's DC power by setting the Battery Switch to the desired setting by positioning the Battery Switch to "1" (Start Battery) or "2" (House Battery) to provide power from one battery or position the Battery Switch to the "1+2" position to supply power from both batteries.

*NOTE: As an added precaution against a depleted start battery, your engine can be started from both batteries, or, in other words, from a combined battery bank. This is accomplished by positioning the House switch to "Combined" together with the Start battery switch to "ON" (refer to the DC Electric chapter of this manual). After starting your engines, return the engine battery selector switch to its standard position.*

Manually check the bilge pumps are working properly by switching the bilge pump toggle switch (located on the DC Panel) to the right. The pump should turn on. The toggle will spring back when released and the pump will turn off again.

Verify the engine compartment blower hose is properly attached (see Waste Systems chapter in this manual).

Deliver power to the DC Panel by switching the DC MAIN breaker switch on the Battery Switch Panel to the "ON" position. Check other DC powered items, such as the fresh water pump, by switching on their respective switches.

Also, do a physical review and ensure the following:

- Seawater intakes that feed the systems (engine, generator, air conditioner) are open (refer to the Water Systems chapter in this manual for details)
- Throttle and shifter operate smoothly
- Steering system operates smoothly
- Engine oil at proper level (refer to the engine manufacturer's OEM manual for details)
- Gear box or saildrive leg oil at proper level (refer to the engine manufacturer's OEM manual for details)
- Engine coolant at proper level (refer to the engine manufacturer's OEM manual for details)
- Engine fuel at the desired level

*NOTE: We recommend executing the Inspection checklists*

## Getting Underway

presented in the Forms and Documents chapter in this manual. These are a comprehensive list of items/issues to review. Continuous execution is beneficial to produce good habits for safe boating.

### 13.3.2 Starting Sequence

*NOTE: Excessive cranking could cause seawater to enter the cylinders and damage the engine, also known as hydrolock. If the engine does not start after cranking for 15 seconds, close the sail drive cooling water seacock (refer to the engine manufacturer's OEM manual for location) to avoid filling the muffler with water. Crank for 10 seconds at a time until the engine starts. When the engine does start, stop the engine immediately and turn off the power switch. Be sure to re-open the seacock and restart the engine. Operate the engine normally.*

1. Move the throttle/shift levers to the neutral (center) position.
2. Press the "Power Switch" button (Fig. 12.2) to energize the panels. The alarm buzzer will sound. Verify that the instrument panel indicators are powered and working.
3. Verify the engine compartment blower is operating properly (place your hand in front of the blower vent located in the starboard transom garage).
4. Press the "Start Switch" button (Fig. 12.2) until the engine starts. The alarm buzzer and alarm lamps should silence and extinguish. If not, press the "Stop Switch" and investigate the cause of the alarm.
5. Once the engines come up to operating temperature, move the shift lever to Fwd and Reverse positions to make sure the transmissions will engage.
6. Now, shut down the engines and recheck your oil and transmission fluid levels.
7. Repeat steps 1-3 and begin your cruise.

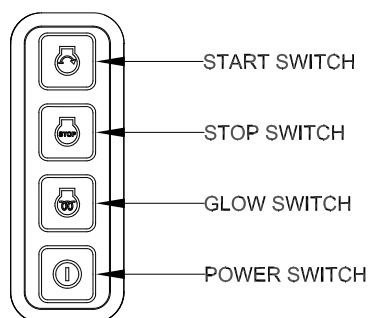


Figure 12.2

### ! WARNING !

In order to prevent premature starter failure, do not continuously crank engine starters for more than 15 seconds.

### ! WARNING !

DO NOT remove cooling system filler cap when engine is hot. Allow to cool and then remove pressure cap slowly, allowing pressure to vent. Hot coolant under pressure may discharge violently.

### ! WARNING !

Exhaust gasses contain Carbon Monoxide. This is a poisonous gas and can cause death. Shut down engines immediately if any exhaust leaks are detected.

*IMPORTANT: Always be careful when starting the engine. Use common sense and good judgment. Shut down the engine immediately if you observe any unsafe operating conditions.*

*IMPORTANT: If engine fails to start within 15 seconds, release switch. Allow starter motor to cool for at least 60 seconds, then try starting the engine again with 10 second attempts.*

*NOTE: Should there be a problem with the battery voltage level, see the section in this chapter for emergency operation.*

## 13.4 Getting Underway

### ! WARNING !

Before ever pulling away from the dock, make sure the shore power cord(s) and shore water hose are disconnected.

Execute the following checklist before departure:

- Disconnect shore power.
- Check that the fresh water tanks are full.
- Verify that you have up to date fire extinguishers and flares.
- Make sure you have the required safety equipment for your passengers.

## Getting Underway

- Ensure your radio is operating properly and understand emergency communication procedures.
- Ensure all rigging and sails are installed and ready for use (refer to the Sails & Rigging section in this manual).
- After the engine reaches operating temperature, accelerate the engine to 2000 RPM's. Check that the voltmeter on the DC Panel reads 13 to 14.5 volts for both batteries.
- Check wind, tide and current to determine the best way to maneuver your boat away from the dock. Cast off mooring lines.
- At low speed, check that gauges, indicators and alarms are normal. Check that sufficient cooling water is being discharged from the exhaust outlets on the transom.
- Shift your boat's engine into forward or reverse, depending on whether you want to move the bow or the stern away from the dock first. Your engines should be running at a slow speed as you move away from the dock.
- Once your boat is in open water, you can safely accelerate to cruising speed. Advance throttle to the setting which provides your desired engine speed (RPM's).

### **WARNING**

Using a damaged or improper cord for shore power can cause electrical shock and serious injury. Use a cord specifically designed for shore power connection. Do not use a household extension cord.

### **CAUTION**

Water is an excellent conductor of electricity. Keep shore power cord out of water. Do not operate any AC device while you, or the cord, are in the water. To prevent injury or equipment damage, keep all AC electric system components dry.

### **WARNING**

DO NOT disconnect the shore power cord to the boat first. You could accidentally drop the cord into

**the water, which may result in electrical shock and serious personal injury.**

### 13.4.1 Getting Ready to Sail

*NOTE: This is not intended to provide a complete guide on sailing. The 'art' of managing a sailboat in all weather, tidal and day/night conditions can not be taught by reading even the best instruction book. If you are not proficient in handling sail boats, please refrain from handling this boat and obtain professional training and certificates, some of which might be required for you to navigate your boat in certain areas or countries.*

1. Power into the wind.
2. Raise and/or unfurl sails, beginning with the main and then the jib.
3. Once each halyard, is tensioned by the winch, the halyard can be locked down into its respective sheet stopper and the halyard removed from the winch, freeing the winch for the next halyard or sheet.
4. However, care should be taken not to inadvertently open the rope clutches, since the sails will lower rapidly if this is done.
5. When the sails are raised, the boat can be laid off and the engine turned off.
6. Once the main is sheeted in and you are sailing upwind, confirm the main topping lift position has some slack so the main can be capable of sheeting in hard without the topping lift being tight.
7. Be sure to retighten the topping lift before lowering the main.
8. After a day of sailing, the sails should be lowered or furled in while again powering into the wind, with the jib furled in first and then by lowering or furling the main.
9. Protect your conventional mainsail by covering it with the sailcover, if applicable.

### 13.3.2 Tuning the Rig

If this is your initial sailing excursion, the mast should be tuned. (Generally, tuning the mast is performed by an experienced commissioning agent.) Please refer to the Sails and Rigging section in this manual for instructions on tuning the mast.

## Getting Underway

### 13.9.4 Spinnaker

To fly the spinnaker, complete the following procedure:

1. Start by heading off to a square run.
2. Leave the mainsail fully out during the hoisting procedure as it will blanket the spinnaker and keep it from filling until you are ready for it to be set.
3. Raise the spinnaker from the starboard side, winching until the halyard is tight.
4. Once it is fully hoisted, slowly head up your desired course and release the furling line from both fiddle block jammers and pull in the sheet until the sail sets.
5. Make sure you have at least two turns of the sheet around the winch.

A thorough wash down of your hull, decks, and rigging with soap and fresh water will help keep your boat looking like new for years.

*NOTE: See the AC Electric chapter in this manual for information on connecting the shore power, and the Water Systems chapter in this manual for information on connecting the dock side water supply.*

### 13.6 Emergency Operations

You should always understand and be prepared to engage in emergency operations aboard your boat. The sea can be unforgiving, and you can find yourself in very bad trouble in a very short time, even if you are prepared.

*Note: Do not rely on this manual to educate you in all the emergency procedures aboard your boat.*

### 13.5 Returning to Port

After completing the day's cruise or excursion and mooring your boat, shut down the engine as follows:

1. Reduce engine speed to idle.
2. Move the throttle/shift lever to the neutral (center) position.
3. Accelerate from low speed to high speed and repeat five times. This will help clean out carbon from engine components.
4. Allow engine to run at idle for about five minutes.
5. Press the "Stop Switch" until the engine stops, followed by the "Power Switch".

Before going ashore, check the following items:

- Seawater intakes that feed the various systems (and generator) are closed
- Shore power is connected.
- Battery charger operating.
- Battery switches are positioned to OFF on the Battery Switch Panel.
- No visible leaks at the propeller shaft.

Always insure that you, and all aboard, know the outlines for emergency operations and the location of emergency equipment. Emergency drills should be developed and routinely implemented. Potential emergency situations may include flooding, explosions, man overboard accidents and fire. Review the book, Chapman Piloting and Seamanship, for assistance in planning emergency responses and the Boating Safety chapter in this manual for additional information.

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MARLOW-HUNTER, LLC

*Chapter 14*

# *Maintenance*

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## Maintenance

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**P**roper care and maintenance of your boat will pay dividends over time on your investment. The appearance, life and functionality of individual parts and of the whole will generally correlate to the discipline and management provided in their maintenance.

This chapter seeks to provide guidelines and procedures to properly maintain your boat. We will separate it into the following sections:

1. Tools / Parts / Materials
2. Exterior
3. Interior
4. Mechanical Components
5. Periodic Maintenance
6. Storage & Lifting
7. Fitting out After Storage

At the end of the chapter, we will offer you some maintenance tips and schedules. However, if any OEM components have recommended maintenance schedules that differ from this Operator's Manual, consider those schedules to supersede those offered here.

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### 14.1 Tools / Parts / Materials

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The following lists are the minimum items recommended to be stored and available on-board:

#### 14.1.1 Tools

- Flashlight
- Extra batteries for flashlight
- Vise grips (small and medium)
- Needle nose pliers
- Screw and nut driver set with ratchet handle
- Multi-bladed knife
- Set of screwdrivers (Phillips and flat blade, including "shorty" in both)
- Offset screwdriver (Phillips and flat blade)
- Set of combination wrenches (box at one end, open end at the other)
- Set of tubing wrenches
- Wire crimping and stripping tool
- Hacksaw

#### 14.1.2 Parts

- Engine oil (Refer to engine/generator manual)
- Antifreeze (Refer to engine/generator manual)

- Oil filters (Refer to engine/generator manual)
- Coolant pump impeller and cover plate gaskets (Refer to engine/generator manual)
- Spare engine hoses and clamps
- Fuel filters (Refer to engine/generator manual)
- Water pipe or hose for freshwater unions
- Pipe or hose unions
- Engine accessory belts
- Propeller and shaft (for extended cruises)

#### 14.1.3 Materials

- Plastic marine tape
- Instant glue
- Silicone rubber
- Electrical tape
- Two-part epoxy adhesive
- Spray lubricant
- Miscellaneous fasteners

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### 14.2 Exterior

---

To keep the exterior of your boat in good condition, you should follow a periodic preventive maintenance program and practice good storage habits. In this section, we offer important suggestions that will help keep your boat in the best possible condition.

#### 14.2.1 General Care and Maintenance

Wash down. After each use, rinse the entire boat with fresh water. If the boat has been used in brackish or salt water, use a mild soap during the wash down.

Coverings. Covering your boat between uses will protect the finish from direct sunlight. Do not cover it with anything that will not allow moisture to evaporate, for example, sheet plastic.

#### 14.2.2 Gelcoat

##### 14.2.2.1 General Gelcoat Protection

Gear Storage. Before storing your boat, remove loose items such as cushions, towels, and similar items. Water trapped under these items can cause gelcoat discoloration and mildew.

Wax. Waxing two to four times a year is recommended. If you are in a climate where you use your boat year

## Maintenance

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round, wax your boat every three months. If you have a summer boating season, wax at the beginning of the season and before winter storage.

Waxing helps protect your boat from everyday elements. Use a wax recommended for fiberglass (gelcoat) finishes. Many automatic, over-the-counter waxes can be used. Check the product label for recommended surfaces and applications.

### 14.2.2.2 Gelcoat Color Fading and Yellowing

Darker colors are more prone to fading because they absorb more of the sun's ultraviolet rays. Whites and off-whites will yellow, usually on the deck radii. If the finish on your boat has started to fade or yellow, and waxing will not restore the finish, compounding with a fine grit compound and a low speed buffer may be necessary. An automotive, fine grit rubbing compound will work well in most cases. When compounding, consider the following guidelines:

- Follow the manufacturer's application instructions.
- Do not apply compound or wax in direct sunlight.
- Never place the buffer in such a manner that the pad touches the ground. The pad will pick up dirt which will cause deep scratches in the finish.
- After compounding, clean the surface with soap and water.
- Apply a good coat of wax.

### 14.2.2.3 Gelcoat Minor Scratches

If you have light surface scratches and rubbing compound does not remove them, wet etching may be necessary. When wet etching, consider the following guidelines:

- Clean the area with soap and water.
- During etching, try to keep the area free of dust and dirt.
- Use a 500 or 600 grit wet and dry sandpaper. Use a sanding block. Sandpaper and sanding blocks can be purchased from automotive supply stores.
- When etching, keep the surface wet. On dry surfaces, press a wet sponge above the etching area. Always keep the sanding block flat on the surface. Never use

the edge or corner. Doing so will make scratches that rubbing compound will not remove.

- After completing wet etching, compound the etched area with a fine grit rubbing compound. Use a low speed (1200 – 2800 rpm) buffer. Several applications of rubbing compound will have to be applied before all the scratches are removed.
- Apply a good coat of wax.

*NOTE: Sanding the gelcoat of the hull, as opposed to etching the gelcoat, will void Marlow-Hunter's bottom blister limited warranty. Contact Marlow-Hunter's Customer Service if you have questions regarding gelcoat sanding.*

### 14.2.2.4 Gelcoat Stains

You can remove stains using a cleaner specifically made for gelcoat surfaces. Any cleaner recommended for cultured marble or fiberglass tubs and sinks will work. Most of these cleaners can be purchased at a grocery store.

If a cleaner does not remove the stain, use a fine grit rubbing compound. When compounding, consider the following guidelines:

- Apply by hand a small amount of the compound to the stain area.
- Using a cotton cloth with medium pressure, rub the compound into the stained area.
- After the stain is removed, wash the area with soap and water.
- Apply a good coat of wax.

## 14.2.3 Stainless Steel

Your boat hardware is made from top quality stainless steel. The mirror finish on most of your stainless hardware is produced by a series of progressive machine and hand polishing operations. It is this careful polishing that makes the stainless finish so beautiful and easy to clean and maintain.

### 14.2.3.1 Cleansers

We have reviewed several general stainless cleansers/polishers to determine their effectiveness in cleaning and protecting your stainless steel. Many performed acceptably when used properly, however, we recommend Collinite® # 850 Metal Wax as one of the most effective

## Maintenance

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cleaning and polishing products.

### 14.2.3.2 Recommended Procedures

- DO...Apply an even layer of the polishing compound onto a clean soft rag and distribute over a manageable area of the stainless surface with a soft rotational motion.
- DO...Repeat the application if some surface stains remain until all the finish is back to the original clean shiny finish.
- DO...Remove any excess polishing compound and polish out the stainless finish for a mirror shine.
- DO...Rinse thoroughly with fresh water after each cruise. Thorough rinsing can prevent a lot of the surface staining that stainless steel experiences when left in contact with salt water residue.
- DO...Dry after each use to prevent mineral deposits from building up on the surface of the finish.
- DO NOT...Scour the stainless. Scouring can damage the original finish.
- DO...Be careful using most brands of cleansers. Often they contain chemical additives which will affect the original high polish finish if left on the stainless.
- DO NOT...Use a steel wool pad to clean your stainless. If a more abrasive product is needed, use a stainless polishing paste being sure to rub in the paste with a clean rag. Steel wool pads have a tendency to break apart and small particles of steel can become embedded in the surface and will rust and will give the appearance that the stainless itself is rusting.

### 14.2.3.3 Chlorides

Today, chlorides are found in almost all soaps, detergents, bleaches and cleansers; chlorides can be aggressive to stainless steel. However, chlorides are very water soluble. Therefore, THOROUGH RINSING of your bright work after each use will help to keep your stainless looking bright and shiny.

### 14.2.2.4 Scratches

Like many metallic surfaces, your stainless steel will scratch. These are merely usage scratches and over time will blend into the overall finish. Surface scratches can be polished out with a polishing paste but this can be a

lengthy and work intensive process.

### 14.2.4 Deck Hatches

#### 14.2.4.1 Gaskets

Wax the rubber gaskets on all deck hatches with a carnauba wax to ensure gasket material does not stick to Plexiglass.

#### 14.2.4.2 Acrylic and Plexiglass

DO NOT use glass cleaning sprays, scouring compounds, or solvents (such as acetone, gasoline, or thinners) to clean acrylic or Plexiglass.

Following are guidelines for cleaning acrylic and Plexiglass parts:

- Wash acrylic hatches, windows, and any other acrylic compounds with mild soap and plenty of lukewarm water.
- Use a clean, soft cloth.
- Apply only a light pressure when cleaning.
- Rinse with clear water, and blot dry with a damp cloth or chamois.

### 14.2.5 Windows

#### 14.2.5.1 Port Lights

See the Acrylics and Plexiglass section above.

##### 14.2.5.1.1 Frames

The port light window frames on your boat are made of high quality aluminum with an enamel paint or anodized surface. The frames need no maintenance other than cleaning with soap and water. Do not use abrasive or strong chemicals. These may damage the finish and allow corrosion to start. Frames should be protected with marine wax.

### 14.2.6 Caulking

All deck fitting, bow rails, hatches, etc, have been caulked with the highest quality material to ensure a waterproof joint with the boat. However, normal use will flex the joint and eventually break down the seal.

## Maintenance

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We recommend that all deck fittings, hatches, windows, rail, etc. be caulked periodically to prevent damaging leaks from developing.

### 14.2.6 Bottom Paint

We recommend an annual cleaning, stripping, and application of anti-fouling paint. Some owners may have problems with paint failure because of unusually deep penetration of the parting compound used in molding the hull. This condition is unpredictable and is not covered by warranty. Usually cleaning and paint peeling or stripping is all that is needed before recoating with a quality anti-fouling paint. Check with your dealer for recommendations about the specific paint to be used in your area.

*NOTE: Sanding the gelcoat of the hull will void Marlow-Hunter's bottom blister limited warranty. Contact Marlow-Hunter's Customer Service if you have questions regarding gelcoat sanding. Non-sanding paint strippers should be used on hull paint.*

### 14.2.7 Cockpit Teak Decking (Option)

Do not use caustic or acidic cleaners on your teak decking. This will not only degrade the decking but will void the OEM warranty. Beyond a daily wash down with plain water, it is recommended to clean weekly with a solution of water and a mild household cleaner or a sudsy ammonia. More specifically, the manufacturer has developed 2 products to safely clean and maintain your teak decking for weekly and monthly application. Check their website or the OEM manual included with your Operator's Manual.

It is not recommended to use oils on the teak decking. Teak already contains natural oils and some petroleum based oils can degrade the caulking. Additionally, oils often act as a carrier for dirt or soot to get into the pores of the wood and darken its color.

### 14.2.8 Sails & Rigging

#### 14.2.8.1 Sails

UV rays are a chief cause of sail degradation. Sail covers are strongly recommended for conventional mainsails (as they are not protected as the in-mast furled mainsail). Ensure the roller furling jib is furled properly and only the protected portions of the sail are exposed to UV rays.

In addition, ensure your sails are properly set and

trimmed. Properly tensioned lines will positively affect the life of your sails.

Depending on your type of sailing and frequency, an annual inspection and servicing are recommended to prolong the life of your sails. Sails should be inspected and serviced for chafe damage, rust, mildew or other impurity accumulation, stitch, fabric and hardware integrity or other possible problems. Sail lofts or other professionals are available to perform inspections and service.

If you chose to service your own sails, ensure you read, understand and follow the instructions of any cleaning product used when washing your sails. Different stains and build-ups will require different cleaning agents. Care must be taken when choosing cleaning agents to ensure they do not negatively affect your sail fabric, stitching or hardware.

*NOTE: Please refer to the sail manufacturer's OEM manual for specific details and maintenance specifications.*

#### 14.2.8.2 Rigging

Without careful inspection and proper maintenance, the rigging is subject to fatigue, wear, discoloration, and therefore, product failure. Remember, regular inspection and cleaning will increase the life of your investment and secure your rigging.

##### 14.2.8.2.1 Standing Rigging

- Always rinse your rigging with fresh water after sailing, especially salt-water sailing. Salt can create corrosion pits, causing cracks and deterioration.
- Clean with a water-soluble chlorine-free detergent. Nonabrasive cleansers are best for hard white vinyl coated cables.
- Inspect rigging for stains. Rust stains may indicate stress cracks or corrosion. Remove stains with synthetic or brass pads. Never use steel wool pads.
- Look for broken wires- a sign of fatigue in rigging. Replace standing rigging if wires are broken.
- Never mix stainless steel and galvanized metals on cable, fittings, pins, cotter keys, etc. If mixing dissimilar metals, electric currents may conduct between metal causing rapid deterioration

Remember that rigging, like everything else, can age. As

## Maintenance

it gets older, it may need to be replaced. The frequency for which this becomes necessary depends on your maintenance and the climate and conditions in which the boat is sailed. For example: If you sail in the Caribbean, it should be replaced every 3-4 years compared to every 10 years for the Great Lakes. You should consult a professional rigger for advice.

### 14.2.8.2.2 Running Rigging

Running rigging should be periodically inspected for line degradation and replaced as needed.

### 14.2.8.2.3 Mast and Boom

With regard to the mast and boom, a few maintenance procedures should be implemented. The boom traveler car should be regularly rinsed with mild detergent and fresh water. The top and bottom of the roller furler mechanism in the furling mast should be regularly washed, rinsed and lubricated. Additionally the roller furling line should be annually inspected and replaced as needed.

*NOTE: Please refer to the rig manufacturer's OEM manual for specific details and maintenance specifications.*

### 14.2.8.2.4 Roller Furling Jib

The roller furling jib assembly should also be annually inspected. The lower bearing and halyard swivel should be annually lubricated in specific locations as outlined in the manufacturer's OEM manual. The entire assembly can be washed with a mild detergent and rinsed with fresh water.

*NOTE: Please refer to the rig manufacturer's OEM manual for specific details and maintenance specifications.*

### 14.2.9 Keel

The keel bolt nuts (Fig. 14.2) should be checked periodically to re-adjust for any thread slippage. At a minimum, the nuts should be checked before the initial launch of each new sailing season. Access to the keel nuts is through the main bilge floor panel in the main salon. Adjustments must be made with deep sockets, sizeable torque wrench and long extension bar. Please refer to Figure 14.1 keel nut torque specs.

Bolt Size (In.)	Nut Torque (Ft/Lbs.)
3/8	21
1/2	45

5/8	97
3/4	132
1	325
1 1/4	546

Figure 14.1



Figure 14.2

Removal, installation and nut adjustments of the keel should be performed by trained and competent professionals.

### 14.2.10 Repairs

In the event materials or specialized tools are required to repair your boat, contact your dealer or Marlow-Hunter for input or assistance in securing those items.

## 14.3 Interior

You can generally clean the surfaces of interior components with a mild cleaner such as Fantastic. Avoid using harsh or abrasive cleaners. Use approved marine sanitary treatment chemicals to control the odor in the toilet and holding tank.

### 14.3.1 Walls

#### 14.3.1.1 Wood



## Maintenance

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The wood used in your boat is treated at the factory with a multi-coat finish process. To maintain the finish, use a high grade of furniture polish.

### 14.3.1.2 Fabric

Some walls on your boat have been crafted with a non-backed fabric material producing a gentler more pleasing appearance. Cleaning this material simply includes using a mild soapy water or 50/50 solution of water and white vinegar to clean water-soluble stains on these surfaces. Water soluble stains can include drinks such as soft drinks, coffee, etc. Clean by blotting rather than rubbing.

Use a citrus based cleaner to remove non water-soluble stains such as grease or oil. Again, clean by blotting from the outside toward the center.

### 14.3.1.3 Hull-liner

See the Fabric section above.

### 14.3.2 Ceilings

Your ceilings will be either a fiberglass headliner or a pocketed network of a soft fabric material similar but distinct from the hull-liner, referred to as Whisper.

#### 14.3.2.1 Fiberglass Headliner

Use a mild soapy water or 50/50 solution of water and white vinegar to clean water-soluble stains on these surfaces. Water soluble stains can include drinks such as soft drinks, coffee, etc. Clean by blotting rather than rubbing.

Use a citrus based cleaner, acetone or other similar solvent to remove non water-soluble stains such as grease or oil. Again, clean by blotting from the outside toward the center.

#### 14.3.2.2 Whisper

See the Fabric section above.

### 14.3.3 Floors

Maintain your hard wood floors using a soft dust attracting and trapping fabric such as a Swiffer. Use furniture polish to clean water and non-water-soluble stains.

### 14.3.4 Dinette Table

Clean your dinette table with a mild soap and water solution or general purpose cleaner.

### 14.3.5 Cushions / Covers

#### 14.3.5.1 Mattress Cover

Periodically dry clean the mattress cover as appropriate.

#### 14.3.5.2 Leather Cushions

See the Fabric section above.

#### 14.3.5.2 Fabric Cushions

See the Fabric section above. These cushions have a zippered back to allow the foam to be removed. These covers can be machine washed from time to time using a gentle cold-water cycle with mild detergent. Hang dry; do not machine dry.

### 14.3.6 Shades

See the Fabric section above.

### 14.3.7 Shower Grate

See the Cockpit Teak Decking section above.

### 14.3.9 Bilges


The bilges are finished with a high quality gelcoat which is easy to keep clean. Several brands of bilge cleaners will dissolve dirt and grime, but will not harm the environment when pumped overboard. If you keep the bilge clean, it is much easier to identify leaks or other problems if they should develop.

*IMPORTANT: The Federal Water Pollution Control Act prohibits the discharge of oil or oily waste into or upon navigable waters in the United States. Violators are subject to a penalty.*

### 14.3.10 Light Bulbs

## Maintenance

BULB	PIC
LED G4 Side Pin Disc	
"Six-Gun" LED, 10-30VDC (1.3W), Directional -ILBA1142-06W??	
SERVICE NOT REQUIRED (SEALED)	
	
SERVICE NOT REQUIRED (SEALED)	
12V / 10W SV8.5	
12V / 10W SV8.5	

BULB	PIC
UPPER: AQUA SIGNAL - 90400002 - 25W; LOWER: AQUA SIGNAL - 90400005 - 10 W	

### 14.3.11 Repairs

In the event materials or specialized tools are required to repair your boat, contact your dealer or Marlow-Hunter for input or assistance in securing those items.

## 14.4 Mechanical Systems and Components

Refer to the OEM manuals supplied by the boat component manufacturers for their recommended periodic maintenance. These manuals may indicate maintenance requirements beyond the minimum maintenance tasks listed in the maintenance charts located in the back of this chapter.

*NOTE: In case of conflicts between the maintenance information in this manual and the manuals supplied by the equipment manufacturer, the equipment OEM manuals take precedence.*

### 14.4.1 Engine Oil

See the engine manufacturer's manual for recommended oils and correct procedures for checking and replenishing oil.

### 14.4.2 Engine Coolant

See the engine manufacturer's manual for recommended coolants and correct procedures for checking and adding coolant.

## ! WARNING !

Hot coolant under pressure may boil over and cause burns or other serious injury when cap is removed. Allow engine to cool. Open pressure cap slowly to allow pressure to vent before removing cap.

### 14.4.3 Engine Exhaust

Visually inspect the engine exhaust systems (hoses,



## Maintenance

joints, manifolds, etc.) for leaks. Make sure all clamps are tight. Check hoses and exhaust boxes for damage. Replace any damaged exhaust system component.

*NOTE: Any discoloration around a joint or gasket usually indicates a leak.*

### 14.4.4 Fuel Filter

Check all fuel filters daily to remove all sediment and water from the filter. Inspect the canister for possible corrosion or deterioration. Replace canister if you observe any corrosion or other deterioration.

Replace the filter element at least once each season, more often if there is contamination of the fuel system. Always replace the bowl gasket each time the filter is reassembled. Check carefully for any signs of leakage.

### 14.4.5 Fuel Line Connections

Check all fuel line connections for leaks at least once a year. Tighten as necessary.

*IMPORTANT: Be careful when tightening fittings. Over-tightening can crack the flair fittings and flair nuts. Use only tube wrenches when tightening connections.*

### 14.4.6 Batteries

#### **WARNING**

**If using lead-acid batteries, avoid spilling battery electrolyte into the engine compartment or bilge. Also, avoid getting saltwater on or in the battery. Either condition can create a gas that is explosive and poisonous if inhaled. If you spill electrolyte, ventilate the area. Neutralize the acid in the electrolyte with baking soda. Clean up neutralized electrolyte with a disposable rag or paper towel. We recommend you use Gel type batteries.**

Although the batteries are relatively maintenance free, some simple routine maintenance can increase the effectiveness and life.

- Keep the batteries fully charged. Batteries kept fully charged last longer than batteries kept at a partial charge.
- If using lead-acid batteries, check the level of the electrolyte regularly. Correct level is just above the plates. Add distilled water only if necessary. Over-filling can

cause poor performance and early failure.

- Check the battery every 30 days. Keep the top of the battery clean. When necessary, clean the top of the battery with a baking soda solution and rinse with fresh water.

*IMPORTANT: To prevent battery failure, do not allow the soda solution to enter the battery cells.*

- Inspect the cables and clamps regularly.
- Remove the battery cables and clean the battery terminals and posts regularly. Use a wire brush or bronze wool.
- After re-connecting the terminals, apply a coating of grease or petroleum jelly (Vaseline) to protect them against corrosion.

*IMPORTANT: Before cleaning the batteries, disconnect and remove them from the boat.*

- Replace corroded or damaged parts immediately.
- Remove the batteries from the boat during periods of extended storage. Store the batteries in a cool (above freezing), dry area.

All batteries lose some charge during storage, but the loss of charge is proportional to the temperature. The lower the temperature, the less charge is lost. Avoid storing the batteries in a humid area. Humidity will lead to corrosion of the terminals.

### 14.4.7 Shore Power Cable Care

#### **WARNING**

**Electrical shock can cause injury or death. Before working on electrical system, disconnect all power sources. Inform others to prevent accidental re-connection of electrical service. All voltages above 12 volts are dangerous. Performing maintenance while connected to shore power can cause electrical shock. Disconnect cord before performing maintenance.**

Clean the cable with a grease cutting household detergent. Apply a vinyl protector periodically.

The metallic parts of the cable are corrosion resistant. You can, however, increase the life of the cable in a salt water environment by wiping the exposed parts with fresh

## Maintenance

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water. Then, dry them and spray them with a moisture repellent.

If the cable is dropped into salt water, rinse the plug and connector end thoroughly in fresh water. Then shake or blow off excess water and allow cable to dry. Spray plug and connector with a moisture repellent before you use the cable again.

### 14.4.8 Windlass Maintenance

Periodically check the motor and control box electrical connections. Remove any residue and cover connections with a small coating of grease.

It is recommended that you annually disassemble the windlass and remove any residue buildup. To perform this maintenance follow all safety procedures and complete the instructions listed in the windlass OEM manual.

1. Using the emergency handle, unscrew and remove the clutch nut and gypsy cone.
2. Unscrew and remove the stripper arm. Pull control are back to clear gypsy and remove gypsy assembly from the drive shaft.
3. Wash down with water to remove any residue.
4. Coat surfaces with a light film of lubricant.
5. Reassemble the unit and tighten the clutch by turning the handle clockwise.

*NOTE: Consult the windlass manufacturer's OEM manual for further details regarding operation, care and maintenance.*



**Ensure power is off before performing work or maintenance on the windlass.**

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### 14.4.9 Electrical System Connections

At least once each year, disconnect electrical connectors in the bilge, engine, and upper control panels. Check the terminals for corrosive buildup. Have your dealer repair connectors and terminals if they are corroded.

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## 14.5 Periodic Maintenance

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Proper and timely maintenance is the best insurance for trouble free and enjoyable boating. Please refer to the maintenance charts located in the back of this chapter to help identify maintenance tasks and their frequency. Use the charts as a checklist.

Remember to check your OEM manuals to understand the recommended periodic maintenance and procedures for their products. OEM period maintenance guidelines will take precedence over the minimum guidelines suggested in this manual.

### 14.5.1 20 Hours of Operation

Following the first 20 hours of operation, complete the maintenance items listed below:

- Check rudder lip seal for leaks (no leaks at all).
- Check all through hull fittings for leaks.
- Check all doors and cabinets for proper fit and operation.
- Tighten all engine mounts.
- Complete engine/generator maintenance as recommended by engine/generator manufacturer.
- Tighten all hose clamps and lubricate them.
- Check and tighten all pressurized water system fittings.
- Check and service batteries, tighten battery connections, and lubricate as needed.

### 14.5.2 Zinc Maintenance

Generally, sacrificial anode maintenance consists of a minimum annual replacement of the zincs. This should be completed during the spring launch procedure for example. The anodes may require more frequent replacement, depending on your docking location and the length of your boating season. If possible, check the anodes for excessive corrosion midway through your boating season. If excessive corrosion is noted, have your dealer or a competent technician replace the sacrificial zinc anode.

#### 14.5.2.1 Sail Drive Leg

The sacrificial anode should be replaced:

## Maintenance

1. every 100 hours of use
2. every 6 months
3. if the anode had degraded to half its original size

Inspection and replacement requires the boat to be out of the water.

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### 14.6 Storage and Lifting

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In most cases, the reason for storage is winter lay up. A competent boat yard should prepare your boat for winter storage. If you are removing your boat from the water for another reason, use the information in this section as a basic guideline. Following the procedures in this section will help to extend the life of your boat and its equipment and simplifies re-commencing in the spring.

Indoor storage is beneficial if you are storing your boat in a climate that produces ice and snow. However, the storage building should be adequately ventilated, not tightly closed. Ventilation, both around and throughout the boat, is very important.

If you use outdoor storage facilities, cover your boat with a canvas cover with provisions for ventilation to keep the boat from “sweating.” Building a frame over the boat to support the canvas will allow the passage of air around the boat. The frame should be a few inches wider than the boat so the canvas will clear the rails.

Before preparing your boat for winter storage, check the condition of the boat and its systems and equipment. Note any repairs needed. The need for other repairs may become apparent during winterization. Make arrangements to have the repairs completed.

#### 14.6.1 Disassemble the Rigging

The rigging should be disassembled as per the manufacturer’s instructions noted in the OEM manual (reverse the assembly instructions). Once disassembled, the sails should be stored dry and free of salt, folded but without wrinkles. The mast and boom should be stored dry or covered with sufficient supports to minimize any deflection. The jib furler assembly should be stored near the other rigging with the center supported to protect the luff extrusion (long center rod).

#### 14.6.2 Lifting Your Boat

Following are guidelines which will help prevent damage to your boat as it is being lifted.

- Never hoist the boat with a greater than normal accumulation of water in the bilge. Fuel and water tanks should be empty.
- Place slings where indicated by the Sling stickers on the gunwale (Fig. 14.3). Proper location of the slings is critical. Lifting at locations other than designated by the Sling stickers may cause damage to the boat. The labeled locations are optimal for balanced lift with the structural integrity for the full distributed weight. Damage caused by improperly placed straps is not covered by the limited warranty.
- Use flat, wide slings made of belting and spreader bars long enough to keep pressure off the gunwale. Do not use cable slings. Pressure by the slings on the gunwale can cause severe gelcoat crazing or more serious hull damage.
- The spreader bar at each sling should be as long as the distance across the widest point the sling surrounds.
- Weight should be primarily distributed along the keel. If a marine railway or platform is used, locate and adjust the blocking to distribute the weight over several areas at the intersection of stringers and bulkheads. The bunks and/or blocks should match deadrise angle and provide adequate support and stability.
- When lifting the boat, keep the bow higher than the stern so the exhaust lines can drain. This will keep water from running forward through the manifold and into the engine itself where the water can become trapped.

*NOTE: Keep the bow higher than the stern every time the boat is lifted. Do not lift the stern to change a propeller. Doing so can cause water to enter the engine. Engine failure is possible if water enters the engine cylinders. This water can cause hydrolock and bend the piston rods. Even a small amount of water can cause rust or other damage.*

#### 14.6.3 Preparing for Storage

- Clean, scrub, and sponge the hull and deck as soon as the boat is pulled from the water and is still in the sling. Cleaning marine growth from the hull is easier when it is still wet.
- Clean the inside of all hull openings, thru hull fittings, and screens. Inspect the hull and underwater gear

## Maintenance

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for signs of wear, deterioration, or damage. Note any damage to the propulsion equipment, helm area, cabin, etc. Make repairs, if at all possible, before covering your boat.

- Fill the fuel tanks with treated fuel to prevent condensation. If you use a stabilizer or conditioner, be sure to follow the instructions on the container.

*IMPORTANT: Do not overfill fuel tanks so fuel flows from the vent. Allow room in the tanks for fuel to expand.*

### Prepare the Engines for Storage:

- In areas where temperatures fall below freezing, the bilge area under the engines must be pumped out and sponged completely dry. Check for areas that did not drain to the pumps. Drain mufflers.

*NOTE: Refer to the engine owner's manual for winterization and storage procedures (i.e. water drainage from the engine block, etc.).*

### Prepare the Batteries for Storage:

- Be sure main battery switch breakers are off.
- Remove batteries from boat and store in area where temperatures remain above freezing.
- Place batteries on a wooden pallet or bench.
- Keep batteries charged. Check electrolyte levels regularly. Add electrolyte if needed.

### Prepare Holding Tank for Storage:

- Empty and rinse holding tank until tank is clean.
- Close head intake valve and remove hose.
- Pour the nontoxic antifreeze into the head and keep flushing the head until the antifreeze reaches the holding tank.

### Prepare the Fresh Water System for Storage:

- Remove the fresh water supply by opening the hot and cold faucets in the galley for 10 minute intervals. Repeat until the fresh water tank is empty.
- Open all faucets in the galley, shower, cockpit shower, etc.
- Drain the water heater. Disconnect lines from the

engine heat exchanger. Drain exchanger and lines.

- Remove hot and cold water lines and hook them together.
- Remove inlet hose from tank and insert it into a container of nontoxic antifreeze. Turn pump on. Starting at faucet furthest from pump, open all faucets until antifreeze flows out.
- Turn off pump and reconnect hose to water heater and pump.

### Prepare Interior of Boat for Storage:

- To keep mildew from forming, remove all items that will hold moisture ( PFD's, towels, blankets, clothing, canvas, etc.).
- Make sure all garbage is removed.
- Clean the inside of the boat. Clean cabinets, drawers, cupboards, storage areas and all surfaces. Allow cabin area to dry and air for at least one day if possible.
- Stand or prop up mattresses and cushions remaining on board to allow good air circulation around them. Hang life preserver and other equipment to prevent mildew.
- Remove any detachable and valuable equipment and electronics.

### Prepare Exterior of Boat for Storage:

- Apply at least one coat of anti-fouling paint. Surface preparation will depend on the status of your bottom paint. Follow the paint manufacturer's recommended procedures for preparation and application.

*NOTE: This coat of paint must be applied during winterization or before the beginning of a new boating season. Check with your dealer for information about the paint you should use.*

- Apply a coat of wax to the entire boat. Put rust inhibitor on all metal parts.
- Cover the boat with a tarpaulin or mooring cover. If the boat is stored outside, you may need to place supports under the cover to shore up pockets where rain or snow can collect.

## 14.6.4 Draining Your Boat

## Maintenance

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Your boat has bilge pumps for draining water from the bilges. Some compartments in the bilge may not drain completely because of the position of the boat. Pump these compartments out then use a sponge to remove all remaining water.

Refer to the previous section “Prepare the Fresh Water System for Storage” for draining and winterizing the fresh water system.

### 14.6.5 Supporting Your Boat During Storage

A cradle is the ideal support for your boat whenever it is not in the water. Properly designed and located, the cradle will support the boat under the main frames preventing damage to the hull.

If a cradle is not available, the boat may be supported on two or three timbers across a boat well or on another firm footing substantial enough to keep the boat level. The timbers and the foundation must be substantial enough to prevent any change in shape while supporting the boat during storage. The weight carried by the supports should be evenly divided, the keel should carry a share of it.

Store the boat with the bow up so any accumulation of moisture will run off.

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## 14.7 Fitting out after Storage

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Refer to the Documents and Forms chapter of this manual for more complete item checklists for the various stages of boat preparation and usage. The following subset lists are an extrapolation of some of those items.

If the hull was not painted during winterizing, prep and paint the hull bottom before removing the boat from its cradle. Follow the paint manufacturer’s recommended procedures for preparation and application.

Before launching your boat, do not load unneeded equipment, furniture, and personal items until the launch and final checkout are complete.

### 14.7.1 Pre-Launch Checkout

Before placing your boat in the water, check and perform the following:

- Check all anchor lines and gear and replace, if necessary.
- Check all thru hull fittings to make sure they are clean. Check all thru-hull hardware for damage and tightness. Repair or adjust as needed.
- Check propeller and the drive leg for proper installation and tightness. Clean propeller. Check the sacrificial anodes on the drive leg.
- Check keel bolt nuts for specified tightness
- Clean battery terminal posts and cable terminals with a wire brush or bronze wool. Install batteries and attach cables. After cable posts are tightened down, coat posts with oil or Vaseline to keep out air and acid. Check all wiring connections and contacts for corrosion and tightness.
- Check all intake valves for easy operation. Check the condition of all hoses.
- Check operation of bilge pumps in manual and automatic modes. Check operation of shower sump pump.
- Check engine compartment blower for proper operation.
- Check operation of all DC circuits.
- Launch your boat.
- Flush entire freshwater system thoroughly.

### 14.7.2 Post Launch Checkout

After launching your boat, check the following:

- Check all sources of possible leaks from bow to stern. Make this check with boat fully in the water, but still in the slings!
- Check the engine following the procedures described in the engine manufacturer’s OEM manuals.
- Completely check the entire exhaust system for the engine. Make sure all exhaust systems are gas tight. If exhaust openings were plugged or covered during storage, remove blockage.

## Maintenance

Routine Maintenance					
Item	Daily	75hr	250hr	Yearly	
Diesel Engine					
Check Exhaust system for leaks	X	X	X	X	
Check for loose or damaged parts	X	X	X	X	
Check fuel system line for leaks	X	X	X	X	
Drain water and sediment from primary fuel filter	X	X	X	X	
Drain water from fuel separator				X	
Clean or replace air cleaner elements			X		
Check oil level	X	X	X	X	
Check oil and filters			X		
Check cooling system for leaks	X	X	X	X	
Check zinc anodes					4 times/year
Tighten engine mounts				X	
Lubricate shifter cables				X	
Transmissions					
Check transmission fluid level	X	X	X	X	
Underwater Gear					
Check rudder and shaft				X	
Check propeller for dents or gouges				X	
Miscellaneous					
Check automatic pumps for operation	X	X	X	X	
Check caulking on deck hardware				X	
Check electrical connections for corrosion				X	
Check bottom paint				X	
Wax deck to maintain sheen				X	
Item	Daily	75hr	250hr	Yearly	

## Maintenance

Check and service batteries				X	
Lubricate terminals				X	
Routine Maintenance					
<b>Item</b>	<b>Daily</b>	<b>75hr</b>	<b>250hr</b>	<b>Yearly</b>	
Tighten all pressurized water system fittings				X	
<b>Item</b>	<b>Daily</b>	<b>25hr</b>	<b>75hr</b>	<b>250hr</b>	<b>Yearly</b>
Miscellaneous					
Halon Fire Extinguishers	X	X	X	X	X
Check battery electrolyte level	X	X	X	X	X
Check raw water strainers (generator, AC unit)	X	X	X	X	X



## SLING LOCATIONS

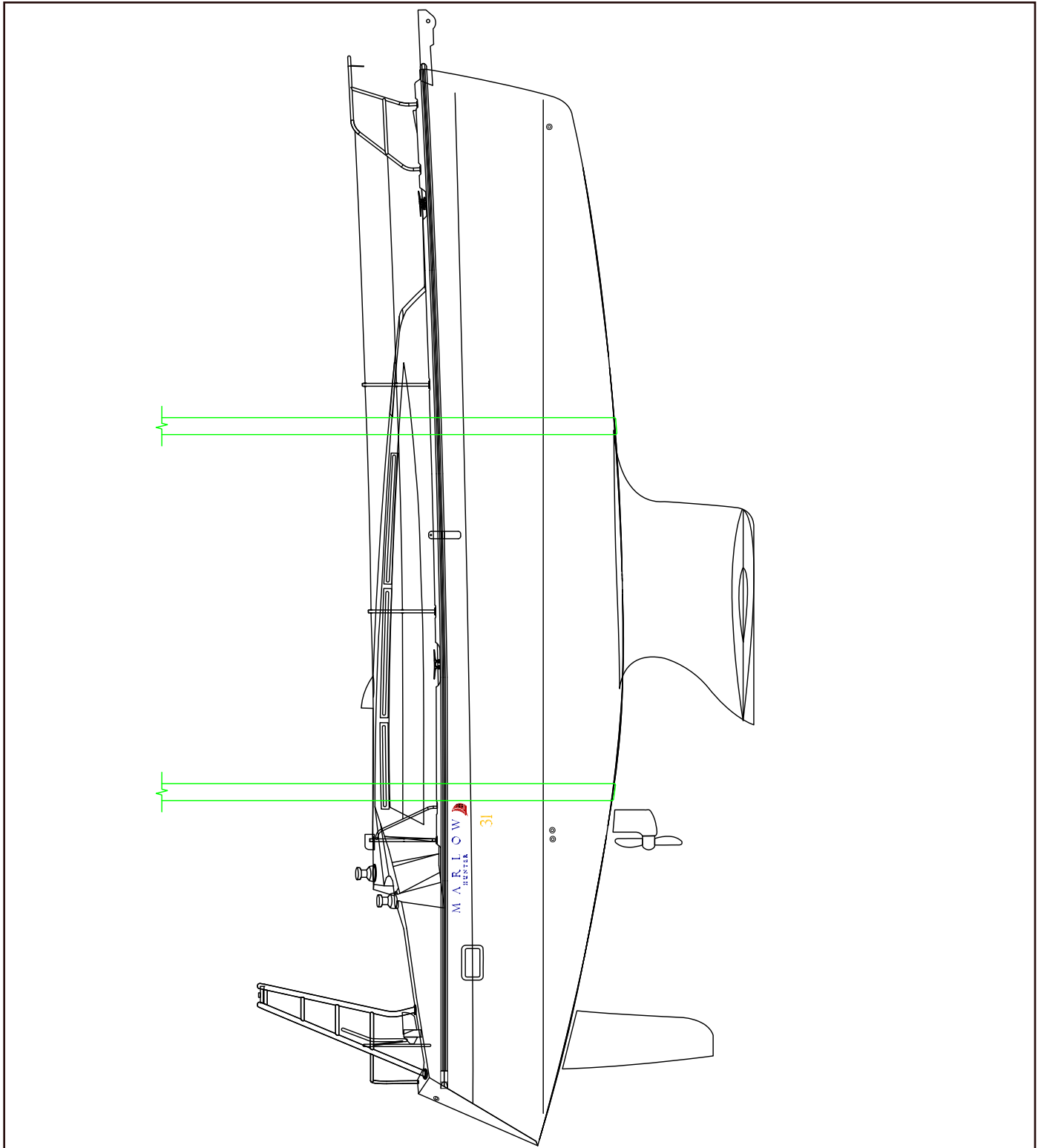


Figure 14.3

This image shows a full page of blank white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page, providing a template for writing or drawing. There are no margins, text, or other markings present.



MARLOW-HUNTER, LLC

*Chapter 15*

# *Glossary*

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## Glossary

<b>Aback:</b>	Describes a sail when the wind strikes it on the lee side.	<b>Auxiliary:</b>	A second method of propelling a vessel. On a sailboat this could be an engine.
<b>Abaft:</b>	Toward the rear of the boat, behind the boat.	<b>Aweigh:</b>	To raise an anchor off the bottom.
<b>Abeam:</b>	At a right angle to the length of the boat.	<b>Back a sail:</b>	To sheet it to windward so that the wind fills on the side that is normally to leeward.
<b>Abreast:</b>	Off the side, even with the boat.	<b>Backing (wind):</b>	The changing of the wind direction, opposite of veering. Clockwise in the southern hemisphere, counter-clockwise in the northern hemisphere.
<b>Admiralty law:</b>	The "law of the sea".	<b>Back-splice:</b>	A method of weaving the end of a rope to keep it from unraveling.
<b>Adrift:</b>	Floating free with the currents and tide, not under control.	<b>Backstay:</b>	A stay that supports the mast from aft and prevents its forward movement.
<b>Aft, After:</b>	Toward the stern (rear) of the boat.	<b>Bail:</b>	To remove water from a boat, as with a bucket or a pump.
<b>Aground:</b>	When a boat is in water too shallow for it to float in, i.e: the boat's bottom is resting on the ground.	<b>Ballast:</b>	Weight at the bottom of the boat to help keep it stable. Ballast can be placed inside the hull of the boat or externally in a keel.
<b>Aid to navigation:</b>	Any fixed object that a navigator may use to find his position, such as permanent land or sea markers, buoys, radio beacons, and lighthouses.	<b>Ballast keel:</b>	A mass of ballast bolted to the keel to increase stability and prevent a keel boat from capsizing.
<b>Amid-ships:</b>	The center of the boat, athwartships and fore and aft.	<b>Bar:</b>	A region of shallow water usually made of sand or mud.
<b>Anchor:</b>	(1) a heavy metal object designed such that its weight and shape will help to hold a boat in its position when lowered to the sea bottom on a rode or chain. (2) The act of using an anchor.	<b>Batten:</b>	A light, flexible strip fed into a batten pocket at the leech of the sail to support the roach.
<b>Anchor locker:</b>	A locker used to store the anchor rode and anchor.	<b>Beam:</b>	1, the maximum breadth of a boat; 2, a transverse member that supports the deck; 3, on the beam means that an object is at right angles to the centerline.
<b>Anchor windlass:</b>	A windlass used to assist when raising the anchor.	<b>Bear away, bear off:</b>	To fall off. A boat falls off the wind when it points its bow further from the eye of the wind. The opposite of heading up.
<b>Anchor-age:</b>	A place where a boat anchors, usually an established and marked area.	<b>Beat:</b>	To sail a zigzag course towards the wind, close-hauled on alternate tacks.
<b>Anemometer:</b>	A device that measures wind velocity.	<b>Beaufort wind scale:</b>	Used to gauge wind speed using observations of the winds effects on trees and other objects.
<b>Anti-fouling:</b>	A poisonous paint compound used to protect the underwater part of a hull from marine growths.	<b>Belay:</b>	To make fast a rope around a cleat, usually with a figure-of-eight knot.
<b>Apparent wind:</b>	The direction and speed of the wind felt by the crew. It is a combination of true wind and that created by the movement of the boat.	<b>Bend:</b>	1, to secure a sail to a spar before hoisting; 2, to moor a boat; 3, a sleeping place on board.
<b>Astern:</b>	Toward the stern of a vessel, or behind the boat; to go astern is to drive the boat in reverse.		
<b>Athwart, Athwartships:</b>	Lying along the ship's width, at right angles to the vessel's centerline.		

## Glossary

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<b>Berth:</b>	(1) a place for a person to sleep. (2) a place where the ship can be secured. (3) a safe and cautious distance, such as "We gave the shark a wide berth."	<b>Broach:</b>	When a boat running downwind slews broadside to the wind and heels dangerously. It is caused by heavy following seas or helmsman's error.
<b>Bight:</b>	A bend or loop in a rope.	<b>Broach-ing:</b>	The unplanned turning of a vessel to expose its side to the oncoming waves. In heavy seas this could cause the boat to be knocked down.
<b>Bilge:</b>	The lower, round part inside the hull where the water collects.	<b>Broad reach:</b>	The point of sailing between a beam reach and a run, when the wind blows over a quarter.
<b>Binnacle:</b>	The mount for the compass, usually located on the wheel's pedestal.	<b>Bulkhead:</b>	An interior wall in a vessel. Sometimes bulkheads are also watertight, adding to the vessel's safety.
<b>Bitt:</b>	A sturdy post mounted on the bow or stern to which anchor or mooring lines may be attached.	<b>Cabin:</b>	A room inside a boat.
<b>Bitter end:</b>	The end of a line. Also the end of the anchor rode attached to the boat.	<b>Camber:</b>	The curvature of an object such as a sail, keel or deck. Usually used when referring to an object's aerodynamic or hydrodynamic properties.
<b>Block:</b>	One or more wheels with grooves in them (pulleys) designed to carry a line and change the direction of its travel. A housing around the wheel allows the block to be connected to a spar, or another line. Lines used with a block are known as tackle.	<b>Can buoy:</b>	A cylindrical buoy painted green and having an odd number used in the United States as a navigational aid. At night they may have a green light. Green buoys should be kept on the left side when returning from a larger body of water to a smaller one.
<b>Block and tackle:</b>	A combination of one or more blocks and the associated tackle necessary to give a mechanical advantage. Useful for lifting heavy loads.	<b>Captain:</b>	The person who is in charge of a vessel and legally responsible for it and its occupants.
<b>Boat-swain:</b>	Also bosun, bos'n, bo's'n, and bo'sun, all of which are pronounced bosun. A crew member responsible for keeping the hull, rigging and sails in repair.	<b>Cardinal points:</b>	The points of North, South, East and West as marked on a compass rose.
<b>Boot-top-ping:</b>	A narrow colored stripe painted between the bottom paint and the topside enamel.	<b>Caulk:</b>	To make the seams between wooden planks watertight by filling with cotton, oakum or a compound.
<b>Bottle-screw:</b>	See Rigging screw.	<b>Cavitation:</b>	The formation of a vacuum around a propeller, causing a loss in efficiency.
<b>Bow:</b>	The front of the boat.	<b>Celestial navigation:</b>	A method of using the stars, sun and moon to determine one's position. Position is determined by measuring the apparent altitude of one of these objects above the horizon using a sextant and recording the times of these sightings with an accurate clock. That information is then used with tables in the Nautical Almanac to determine one's position.
<b>Bowline:</b>	A knot used to make a loop in a line. Easily untied, it is simple and strong. The bowline is used to tie sheets to sails.	<b>Center line:</b>	The imaginary line running from bow to stern along the middle of the boat.
<b>Breakers:</b>	A wave that approaches shallow water, causing the wave height to exceed the depth of the water it is in, in effect tripping it. The wave changes from a smooth surge in the water to a cresting wave with water tumbling down the front of it.		
<b>Bridge:</b>	The room from which a ship is controlled. On a smaller boat this is usually not a room, is outside, and is known as a cockpit.		

## Glossary

<b>Center of effort (COE):</b>	The point at which all the forces acting on the sails are concentrated.	<b>Compass course:</b>	The course as read on a compass. The compass course has added the magnetic deviation and the magnetic variation to the true course.
<b>Center of lateral resistance (CLR):</b>	The underwater center of pressure about which a boat pivots when changing course.	<b>Compass rose:</b>	A circle on a chart indicating the direction of geographic north and sometimes also magnetic north. Charts usually have more than one compass rose. In that case the compass rose nearest to the object being plotted should be used as the geographic directions and magnetic variations may change slightly in different places on the chart.
<b>Center-board:</b>	A board lowered through a slot in the keel to reduce leeway.	<b>Coordinated Universal Time (UTC):</b>	The international time standard. It is the current term for what was commonly referred to as Greenwich Meridian Time (GMT). Zero (0) hours UTC is midnight in Greenwich England, which lies on the zero longitudinal meridian. Universal time is based on a 24 hour clock, therefore, afternoon hours such as 4 p.m. UTC are expressed as 16:00 UTC (sixteen hours, zero minutes). Since a day is 24 hours long, the world may be split into 15 degree wide longitudinal bands (360 degrees/24 hours). Each band represents one hour. As an example, Huntsville Alabama is located at approximately 90 degrees west longitude, hence, local time lags UTC time by 6 hours (90/15, assuming Central Standard Time, 5 hours in Central Daylight Time). So, if the universal time is 14:30 UTC, United States Central Standard Time would be 8:30 am CST. < <a href="http://www.ghcc.msfc.nasa.gov/utc.html">http://www.ghcc.msfc.nasa.gov/utc.html</a> >
<b>Chain pawl:</b>	A short lug which drops into a toothed rack to prevent the anchor chain running back.	<b>Cotter pin:</b>	Soft, metal pin folded back on itself to form an eye.
<b>Chain plate:</b>	A metal plate bolted to the boat to which the shrouds or backstays are attached.	<b>Course:</b>	The direction in which a vessel is steered, usually given in degrees; true, magnetic or compass.
<b>Channel:</b>	A navigable route on a waterway, usually marked by buoys. Channels are similar to roads where the water is known to be deep enough for ships or boats to sail without running aground.	<b>Cringle:</b>	1, a rope loop, found at either end of a line of reef points; 2, an eye in a sail.
<b>Chart datum:</b>	Reference level on a chart below which the tide is unlikely to fall. Soundings are given below chart datum. The datum level varies according to country and area.	<b>Current:</b>	The movement of water, due to tides, river movement and circular currents caused by the motion of the earth.
<b>Chart table:</b>	A table designated as the area in the boat where the navigator will study charts and plot courses.		
<b>Chine:</b>	The location where the deck joins the hull of the boat.		
<b>Chop:</b>	Small, steep disorderly waves.		
<b>Cleat:</b>	A wooden, metal or plastic fitting around which rope is secured.		
<b>Clevis pin:</b>	A locking pin through which a split ring is passed to prevent accidental withdraw.		
<b>Clew:</b>	The after, lower center of a sail where the foot and leech meet.		
<b>Close reach:</b>	The point of sailing between close-hauled and a beam reach, when the wind blows forward of the beam.		
<b>Close-hauled:</b>	The point of sailing closest to the wind; see also beat.		
<b>Close-winded:</b>	Describes a boat able to sail very close to the wind.		
<b>Coaming:</b>	The raised structure surrounding a hatch, cockpit, etc., which prevents water entering.		



## Glossary

<b>Davit:</b>	A device that projects beyond the side of the boat to raise objects from the water. Typically a single davit is used on the bow of a vessel to raise an anchor, and a pair are used on the side or stern of the vessel to raise a dinghy.	<b>Drift:</b>	1, to float with the current or wind; 2, US the speed of a current (rate UK); 3, UK: the distance a boat is carried by a current in a given time.
<b>Dead ahead:</b>	A position directly in front of the vessel.	<b>Drogue:</b>	A sea anchor put over the stern of a boat or life raft to retard drift.
<b>Dead reckoning:</b>	A method of determining position by making an educated guess based on last known position, speed and currents.	<b>Drop keel:</b>	A retractable keel which can be drawn into the hull, when entering shallow waters and recovering on to a trailer.
<b>Dead run:</b>	Running with the wind blowing exactly aft, in line with the center-line.	<b>Echo-sounder:</b>	An electrical depth sounder that uses sound echoes to determine water depth. It does so by timing how long it takes a sound pulse to leave the instrument travel to the seafloor and return to the receiver on the ship.
<b>Deck-head:</b>	The underside of the deck, viewed from below (the ceiling).	<b>Eye of the wind:</b>	Direction from which the true wind blows.
<b>Depth sounder:</b>	An instrument that uses sound waves to measure the distance to the seafloor.	<b>Fair:</b>	Well-faired line or surface is smoother with no bumps, hollows or abrupt changes in directions.
<b>Deviation:</b>	The difference between the direction indicated by the compass needle and the magnetic meridian; caused by object aboard.	<b>Fairlead:</b>	A fitting through which a line is run to alter the lead of the line.
<b>Displacement:</b>	The weight of a boat measured as a the weight of the amount of water it displaces. A boat displaces an amount of water equal to the weight of the boat, so the boat's displacement and weight are identical.	<b>Fall off:</b>	Also bear away or bear off. A boat falls off the wind when it points its bow farther from the eye of the wind. The opposite of heading up.
<b>Displacement speed:</b>	Also hull speed. The theoretical speed that a boat can travel without planing, based on the shape of its hull. This speed is 1.34 times the length of a boat at its waterline. Since most monohull sailboats cannot exceed their hull speed, longer boats are faster.	<b>Fathom:</b>	The measurement used for depths of water and lengths of rope. 1 fathom = 6 ft. or 1.83m.
<b>Distance made good:</b>	The distance traveled after correction for current, leeway and other errors that may not have been included in the original distance measurement.	<b>Fetch:</b>	The distance that wind and seas (waves) can travel toward land without being blocked. In areas without obstructions the wind and seas can build to great strength, but in areas such as sheltered coves and harbors the wind and seas can be quite calm.
<b>Down-haul:</b>	A rope fitted to pull down a sail or spar.	<b>Fid:</b>	A tapered tool used for splicing heavy rope and for sail-making, often hollow.
<b>Down-wind:</b>	In the direction the wind is blowing.	<b>Fiddle:</b>	A raised border for a cabin table, chart table etc., to prevent objects falling off when the boat heels.
<b>Draft:</b>	The vertical distance from the waterline to the lowest point of the keel.	<b>Fix:</b>	The position of the vessel as plotted from two or more position lines.
<b>Drag:</b>	1, an anchor drags when it fails to hold; 2, the force of wind on the sails, or water on the hull, which impedes the boat's progress.	<b>Flotsam:</b>	Debris floating on the water surface.
		<b>Following sea:</b>	Sea with waves approaching from the stern of the boat.
		<b>Fore:</b>	Toward the bow (front) of the vessel.

## Glossary

<b>Forecas- tle:</b>	Also fo'c'sle or fo'csle. Pronounced fo'csle. The most forward below decks area of a vessel.	<b>Guy:</b>	A steadying rope for a spar; a spinnaker guy controls the fore and aft position of the spinnaker pole; the foreguy holds the spinnaker pole forward and down.
<b>Forestay:</b>	The foremost stay, running from the mast-head to the stemhead, to which the head-sail is hanked.	<b>Gybe:</b>	To change from one tack to another by turning the stern through the wind.
<b>Free- board:</b>	Vertical distance between the waterline and the top of the deck.	<b>Hail:</b>	To attempt to contact another boat or shore, either by voice or radio.
<b>Gale:</b>	A storm with a wind speed between 34 to 40 knots.	<b>Halyard:</b>	Rope used to hoist and lower sails.
<b>Galley:</b>	The kitchen area on a boat.	<b>Hand rail:</b>	Hand hold. Usually along the cabin top or ladder.
<b>Genoa:</b>	A large headsail, in various sizes, which overlaps the mainsail and is hoisted in light to fresh winds on all points of sailing.	<b>Hank:</b>	Fitting used to attach the luff of a sail to a stay.
<b>Gimbals:</b>	Two concentric rings, pivoted at right angles, which keeps objects horizontal despite the boat's motion, e. g. compass and cooker.	<b>Harbor- master:</b>	The individual who is in charge of a harbor.
<b>Global Position- ing Sys- tem:</b>	GPS for short. A system of satellites that allows one's position to be calculated with great accuracy by the use of an electronic receiver.	<b>Hatch:</b>	A sliding or hinged opening in the deck, providing people with access to the cabin or space below.
<b>Go about:</b>	To turn the boat through the eye of the wind to change tack.	<b>Haul out:</b>	Remove a boat from the water.
<b>Goose- neck:</b>	The fitting attaching the boom to the mast, allowing it to move in all directions.	<b>Hawes pipe:</b>	see Navel pipe.
<b>Goosew- ing:</b>	To boom-out the headsail to windward on a run by using a whisker pole to hold the sail on the opposite side to the mainsail.	<b>Hawse hole:</b>	A hole in the hull for mooring lines to run through.
<b>Great cir- cle route:</b>	A course that is the shortest distance between two points; the center of a great circle is the center of the earth.	<b>Hawser:</b>	A rope that is very large in diameter, usually used when docking large vessels.
<b>Green- wich Merid- ian Time (GMT):</b>	A time standard that is not affected by time zones or seasons. Now called Coordinated Universal Time (UTC).	<b>Hazard:</b>	An object that might not allow safe operation. A group of rocks just under the water or a submerged wreck could be a navigational hazard.
<b>Ground swells:</b>	Swells that become shorter and steeper as they approach the shore due to shallow water.	<b>Head:</b>	The toilet and toilet room in a vessel.
<b>Ground tackle:</b>	General term used for anchoring gear.	<b>Head seas:</b>	Waves coming from the front of the vessel.
<b>Guard rail:</b>	A metal rail fitted around the boat to prevent the crew falling overboard.	<b>Head up:</b>	To turn the bow more directly into the eye of the wind. The opposite of falling off.
<b>Gudgeon:</b>	A rudder fitting. It is the eye into which the pintle fits.	<b>Headfoil:</b>	A streamlined surround to a forestay, with a groove into which a headsail luff slides.
		<b>Head-top- wind:</b>	When the bows are pointing right into the wind.
		<b>Headway:</b>	The forward motion of a vessel through the water.
		<b>Heave-to:</b>	To back the jib and lash the tiller to leeward; used in heavy weather to encourage the boat to lie quietly and to reduce headway.
		<b>Heaving line:</b>	A light line suitable for throwing ashore.

## Glossary

<b>Heaving to:</b>	To slow or stop the forward motion of the boat, such as when in heavy seas.	<b>Land breeze:</b>	A wind moving from the land to the water due to temperature changes in the evening.
<b>Heavy seas:</b>	When the water has large or breaking waves in stormy conditions.	<b>Lanyard:</b>	A short line attached to one object, such as a knife, with which it is secured to another.
<b>Heavy weather:</b>	Stormy conditions, including rough, high seas and strong winds.	<b>Lash:</b>	To tie something with a line.
<b>Heel:</b>	To lean over to one side.	<b>Launch:</b>	(1) to put a boat in the water. (2) a small boat used to ferry people to and from a larger vessel.
<b>High tide:</b>	The point of a tide when the water is the highest. The opposite of low tide.	<b>Lead line:</b>	A line with a weight on the end used to measure depth. The lead is dropped into the water and marks on the line are read to determine the current water depth. The lead usually has a cavity to return a sample of the bottom type (mud, sand, etc.).
<b>Hitch:</b>	A knot used to attach a line to a cleat or other object.	<b>League:</b>	Three nautical miles.
<b>Horizon:</b>	Where the water and sky or ground and sky appear to intersect.	<b>Lee shore:</b>	A shore on to which the wind blows.
<b>Hull:</b>	The main structural body of the boat, not including the deck, keel, mast, or cabin. The part that keeps the water out of the boat.	<b>Leech:</b>	1, the after edge of a triangle sail; 2, both side edges of a square sail.
<b>Hurricane:</b>	A strong tropical revolving storm of force 12 or higher. In the northern hemisphere; hurricanes revolve in a clockwise direction. In the southern hemisphere they revolve counterclockwise and are known as typhoons.	<b>Leehelm:</b>	The tendency of a boat to bear away from the wind.
<b>Inboard:</b>	(1) toward the center of the boat. (2) an engine that is mounted inside the boat.	<b>Leeward:</b>	The direction away from the wind. Opposite of windward.
<b>Inflatable:</b>	A dinghy or raft that can be inflated for use or deflated for easy stowage.	<b>Leeway:</b>	The sideways movement of a boat away from the wind, usually unwanted. Keels and other devices help prevent a boat from having excessive leeway.
<b>Isobars:</b>	Lines on a weather map joining places of equal atmospheric pressure.	<b>Life jacket:</b>	A device used to keep a person afloat. Also called a life preserver, life vest, PFD or personal flotation device.
<b>Jackstay:</b>	A line running fore and aft, on both sides of the boat, to which safety harnesses are clipped.	<b>Life raft:</b>	An emergency raft used in case of serious problems to the parent vessel, such as sinking.
<b>Jury:</b>	A temporary device to replace lost or damaged gear.	<b>Lifeline:</b>	A wire or rope rigged around the deck to prevent the crew falling overboard.
<b>Keel:</b>	A flat surface built into the bottom of the boat to reduce the leeway caused by the wind pushing against the side of the boat. A keel also usually has some ballast to help keep the boat upright and prevent it from heeling too much.	<b>Limber holes:</b>	Gaps left at the lower end of frames above the keel to allow water to drain to the lowest point of the bilges.
<b>Kicking strap:</b>	A line used to pull the boom down, to keep it horizontal, particularly on a reach or run.	<b>List:</b>	A boat's more or less permanent lean to one side, owing to the improper distribution of weight, e.g., ballast or water.
<b>Knot:</b>	(1) a speed of one nautical mile per hour. (2) a method of attaching a rope or line to itself, another line or a fitting.		

## Glossary

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<b>Log:</b>	(1) a device used to measure the distance traveled through the water. The distance read from a log can be affected by currents, leeway and other factors, so those distances are sometimes corrected to a distance made good.	<b>Midships:</b>	A place on a boat where its beam is the widest.
<b>Longi- tude:</b>	Imaginary lines drawn through the north and south poles on the globe used to measure distance east and west. Greenwich England is designated as 0° with other distances being measured in degrees east and west of Greenwich.	<b>Mizzen:</b>	1, the shorter, after-mast on a ketch or yawl; 2, the fore and aft sail set on this mast.
<b>Luff:</b>	The forward edge of a sail. To luff up is to turn a boat's head right into the wind.	<b>Moor:</b>	To attach a boat to a mooring, dock, post, anchor, etc.
<b>Luff groove:</b>	A groove in a wooden or metal spar into which the luff of a headsail is fed.	<b>Mooring:</b>	A place where a boat can be moored. Usually a buoy marks the location of a firmly set anchor.
<b>Lurch:</b>	The sudden roll of a boat.	<b>Mooring line:</b>	A line used to secure a boat to an anchor, dock, or mooring.
<b>Magnetic north:</b>	The direction to which a compass points. Magnetic north differs from true north because the magnetic fields of the planet are not exactly in line with the north and south poles. Observed differences between magnetic and true north is known as magnetic variation.	<b>Nautical mile:</b>	Distance at sea is measured in nautical miles, which are about 6067.12 feet, 1.15 statute miles or exactly 1852 meters. Nautical miles have the unique property that a minute of latitude is equal to one nautical mile (there is a slight error because the earth is not perfectly round.) Measurement of speed is done in knots where one knot equals one nautical mile per hour. A statute mile is used to measure distances on land in the United states and is 5280 feet.
<b>Make fast:</b>	To attach a line to something so that it will not move.	<b>Navel pipe:</b>	A metal pipe in the foredeck through which the anchor chain passes to the locker below.
<b>Make way:</b>	Moving through the water.	<b>Navi- gation lights:</b>	Lights on a boat help others determine its course, position and what it is doing. Boats underway should have a red light visible from its port bow, a green light on the starboard bow and a white light at its stern. Other lights are required for vessels under power, fishing, towing, etc.
<b>Marlin spike:</b>	A pointed steel or wooden spike used to open up the strands of rope or wire then splicing.	<b>Noon Sight:</b>	A vessel's latitude can be found, using a sextant, when a heavenly body on the observer's meridian is at its greatest altitude. The sight of the sun at noon is the one most frequently taken.
<b>Mast Step:</b>	The socket in which the base of the mast is located.	<b>Off the wind:</b>	With the sheets slacked off, not close-hauled.
<b>Measured mile:</b>	A distance of one nautical mile measured between buoys or transits/ranges ashore, and marked on the chart.	<b>On the wind:</b>	Close-hauled.
<b>Member:</b>	A part of the skeleton of the hull, such as a stringer laminated into fiberglass hull to strengthen it.	<b>Out haul:</b>	A rope used to pull out the foot of a sail.
<b>Meridian:</b>	An imaginary line encircling the Earth that passes through the poles and cuts at right angles through the Equator. All lines of longitude are meridians.	<b>Outboard:</b>	On the side of the hull that the water is on. Outboard engines are sometimes just called outboards.
<b>Messen- ger:</b>	A small line used to pull a heavier line or cable. The messenger line is usually easier to throw, lead through holes or otherwise manipulate than the line that it will be used to pull.		

## Glossary

<b>Overall length (OAL):</b>	The boat's extreme length, measured from the foremost part of the bow to the aftermost part of the stern, excluding bowsprit, self-steering gear etc.	<b>Propeller:</b>	An object with two or more twisted blades that is designed to propel a vessel through the water when spun rapidly by the boat's engine.
<b>Pad eye:</b>	A small fitting with a hole used to guide a line.	<b>Prow:</b>	The part of the bow forward of where it leaves the waterline.
<b>Painter:</b>	A line attached to the bow of a dinghy and used to tie it up or tow it.	<b>Pulpit:</b>	A sturdy railing around the deck on the bow.
<b>Parallels:</b>	Lines of latitude	<b>Pushpit:</b>	Metal guard rail fitted at the stern.
<b>Pay out:</b>	To let out a line.	<b>Quarter:</b>	The side of a boat aft of the beam. There are both a port quarter and a starboard quarter.
<b>PFD:</b>	Personal Flotation Device, a device used to keep a person afloat. Also called a life jacket, life preserver or life vest.	<b>Quarter:</b>	The portion of the boat midway between the stern and the beam; on the quarter means about 45 degrees abaft the beam.
<b>Pile, pil-ing:</b>	A pole embedded in the sea bottom and used to support docks, piers and other structures.	<b>Quarter-ing sea:</b>	A sea which comes over the quarter of the boat.
<b>Pintle:</b>	A rudder fitting with a long pin that fits into the gudgeon to form a hinged pivot for the rudder.	<b>Quarters:</b>	Sleeping areas on the boat.
<b>Pitch:</b>	1, the up and down motion of the bows of a boat plunging over the waves; 2, the angle of the propeller blades.	<b>Radar:</b>	Radio detection and ranging. An electronic instrument that uses radio waves to find the distance and location of other objects. Used to avoid collisions, particularly in times of poor visibility.
<b>Point of sailing:</b>	The different angles from which a boat may sail; the boat's course relative to the direction of the wind.	<b>Radio beacon:</b>	A navigational aid that emits radio waves for navigational purposes. The radio beacon's position is known and the direction of the radio beacon can be determined by using a radio direction finder.
<b>Poop deck:</b>	A boat's aft deck.	<b>Rake:</b>	The fore and aft deviation from the perpendicular of a mast or other feature of a boat.
<b>Port:</b>	(1) the left side of the boat from the perspective of a person at the stern of the boat and looking toward the bow. The opposite of starboard. (2) A porthole. A window in the side of a boat, usually round or with rounded corners. Sometimes portholes can be opened, sometimes they are fixed shut. Also see hatches.	<b>Range:</b>	1, see transit; 2, of tides, the difference between the high and low water levels of a tide; 3, the distance at which a light can be seen.
<b>Port tack:</b>	A boat is on a port tack when the wind strikes the port side first and the mainsail is out to starboard. A boat on the port tack gives way to a boat on a starboard tack.	<b>Rating:</b>	A method of measuring certain dimensions of a yacht to enable it to take part in handicap races.
<b>Porthole:</b>	A port, a window in the side of a boat, usually round or with rounded corners. Sometimes portholes can be opened, sometimes they are fixed shut.	<b>Reach:</b>	To sail with the wind approximately on the beam; all sailing points between running and close-hauled.
<b>Position line/ Line of position:</b>	A line drawn on a chart, as a result of taking a bearing, along which the boat's position must be, i.e. two position lines give a fix.	<b>Reef:</b>	To reduce the sail area by folding or rolling surplus material on the boom or forestay.
<b>Pram:</b>	A type of dinghy with a flat bow.	<b>Reefing pennant:</b>	Strong line with which the luff or leech cringle is pulled down to the boom when reefing.



## Glossary

<b>Reeve:</b>	Leading a line through a block or other object.	<b>Serving mallet:</b>	Tool with a grooved head, used when serving a rope to keep the twine at a constant and high tension.
<b>Rhumb line:</b>	A line cutting all meridians at the same angle; the course followed by a boat sailing in a fixed direction.	<b>Set:</b>	1, to hoist a sail; 2, the way in which the sails fit; 3, the direction of tidal current or steam.
<b>Riding light to anchor light:</b>	An all-around white light, usually hoisted on the forestay, to show that a boat under 50 ft. (15m.) is at anchor. It must be visible for 2 mls. (3 km.).	<b>Shackle:</b>	A metal link with a removable bolt across the end; of various shapes: D, U.
<b>Rigging screw:</b>	A deck fitting with which the tensions of standing rigging, e.g. stays, shrouds, etc. are adjusted.	<b>Sheathing:</b>	A covering to protect the bottom of a boat.
<b>Roach:</b>	The curved part of the leech of a sail that extends beyond the direct line from head to clew.	<b>Sheave:</b>	A grooved wheel in a block or spar for a rope to run on.
<b>Rope:</b>	Traditionally a line must be over 1 inch in size to be called a rope.	<b>Sheep-shank:</b>	A knot used to temporarily shorten a line.
<b>Rudder post:</b>	The post that the rudder is attached to. The wheel or tiller is connected to the rudder post.	<b>Sheet:</b>	The rope attached to the clew of a sail or to the boom, enabling it to be controlled or trimmed.
<b>Run:</b>	To run with the wind aft and with the sheets eased well out.	<b>Shrouds:</b>	Ropes or wires, usually in pairs, led from the mast to the chain plates at deck level to prevent the mast falling sideways; part of the standing rigging.
<b>Running rigging:</b>	All the moving lines, such as sheets and halyards, used in the setting and trimming of sails.	<b>Sloop:</b>	A single-masted sailing boat with a main-sail and one head sail.
<b>Safety harness:</b>	A device worn around a person's body that can be attached to the ship to prevent the person from being separated from the ship.	<b>Snatch block:</b>	A block that can be opened on one side, allowing it to be placed on a line that is already in use.
<b>Sampson post:</b>	A strong post used for to attach lines for towing or mooring.	<b>Spar:</b>	A general term for any wooden or metal pole, e.g., mast or boom, used to carry or give shape to sails.
<b>Scope:</b>	The length of rope or cable paid out when moor anchoring.	<b>Spindrift:</b>	Spray blown along the surface of the sea.
<b>Screw:</b>	A propeller.	<b>Spinnaker:</b>	A large, light, balloon shaped sail set when reaching or running.
<b>Scuppers:</b>	1, holes in the toe rail that allow water to drain off the deck; 2, drain cockpit through hull.	<b>Splice:</b>	To join ropes or wire by unlaying the strands and interweaving them.
<b>Seacock:</b>	A valve that shuts off an underwater inlet or outlet passing through the hull.	<b>Split pin:</b>	See cotter pin.
<b>Secure:</b>	To make fast. To stow an object or tie it in place.	<b>Spread-ers:</b>	Horizontal struts attached to the mast, which extends to the shrouds and help to support the mast.
<b>Seize:</b>	To bind two ropes together, or a rope to a spar, with a light line.	<b>Stall:</b>	A sail stalls when the airflow over it breaks up, causing the boat to lose way.
<b>Serve:</b>	To cover and protect a splice or part of a rope with twine bound tightly against the lay.	<b>Stanchion:</b>	Upright metal post bolted to the deck to support guardrails or lifelines.
		<b>Standing part:</b>	The part of a line not used when making a knot; the part of a rope that is made fast, or around which the knot is tied.

## Glossary

<b>Standing rigging:</b>	The shrouds and stays that are permanently set up and support the mast.	<b>Tang:</b>	A strong metal fitting by which standing rigging is attached to the mast or other spar.
<b>Star-board:</b>	The right side of the boat from the perspective of a person at the stern of the boat and looking toward the bow.	<b>Telltale:</b>	A small line free to flow in the direction of the breeze. It is attached to sails, stays in the slot, and in other areas, enabling the helmsman and crew to see how the wind is flowing.
<b>Starboard tack:</b>	A boat is the starboard tack when the wind strikes the starboard side first and the boom is out to the port.	<b>Tender of dinghy:</b>	A small boat used to ferry stores and people to a yacht.
<b>Stay:</b>	Wire or rope which supports the mast in a fore and aft direction; part of the standing rigging.	<b>Terminal fitting:</b>	Fitting at the end of a wire rope by which a shroud or stay can be attached to the mast, a tang or a rigging screw/ turn-buckle.
<b>Steerage way:</b>	A boat has steerage way when it has sufficient speed to allow it to be steered, or to answer the helm.	<b>Thwart-ships:</b>	Also athwartships. Across the width of a boat.
<b>Stem:</b>	The forward edge of the bow. On a wooden boat the stem is a single timber.	<b>Tide:</b>	The vertical rise and fall of the oceans caused by the gravitational attraction of the moon.
<b>Stern:</b>	The aft part of a boat. The back of the boat.	<b>Toe rail:</b>	Small rail around the deck of a boat. The toe rail may have holes in it to attach lines or blocks. A larger wall is known as a gunwale.
<b>Stern line:</b>	Line running from the stern of the boat to a dock when moored.	<b>Topping lift:</b>	A line from the masthead to a spar, normally the boom, which is used to raise it.
<b>Sternway:</b>	The backward, stern-first movement of a boat.	<b>Topsides:</b>	The sides of the hull above the waterline and below the deck.
<b>Stow:</b>	To put something away.	<b>Track:</b>	1, the course a boat has made good; 2, a fitting on the mast or boom into which the slides on a sail fit; 3, a fitting along which a traveller runs, used to alter the angle of the sheets.
<b>Stringer:</b>	A fore and aft member, fitted to strengthen the frames.	<b>Transit:</b>	The time steaming from port to the study site and vice versa.
<b>Stuffing box:</b>	A fitting around the propeller shaft to keep the bearing lubricated and to keep water out of the boat.	<b>Traveller:</b>	1, a ring or hoop that can be hauled along a spar; 2, a fitting that slides in a track and is used to alter the angle of the sheets.
<b>Swivel:</b>	A rotating fitting used to keep a line from tangling.	<b>Trim:</b>	1, to adjust the angle of the sails, by means of sheets, so that they work most efficiently; 2, to adjust the boat's load, and thus the fore and aft angle at which it floats.
<b>Tabernacle:</b>	A hinged support for the bottom of a mast so that the mast can be lowered easily when passing under bridges.	<b>True wind:</b>	The direction and speed of the wind felt when stationary, at anchor or on land.
<b>Tack:</b>	1, the lower forward corner of a sail; 2, to turn the boat through the wind so that it blows on the opposite sides of the sails.	<b>Turnbuckle:</b>	See Rigging screw.
<b>Tack pennant:</b>	A length of wire with an eye in each end, used to raise the tack of a headsail some distance off the deck.	<b>Under way:</b>	A boat is under way when it is not made fast to shore, at anchor or aground.
<b>Tacking:</b>	Working to windward by sailing close-hauled on alternate courses so that the wind is first on one side of the boat, then on the other.		
<b>Tackle:</b>	A purchase system comprising of rope and blocks that is used to gain mechanical advantage.		



## Glossary

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<b>Uphaul:</b>	A line used to raise something vertically, e.g., the spinnaker pole.	<b>Yawl:</b>	A two masted boat with a mizzen stepped aft of the rudder stock/ post.
<b>Upwind:</b>	To windward, in the direction of the eye of the wind.	<b>Zulu:</b>	Used to indicated times measured in Coordinated Universal Time, a successor to Greenwich Mean Time. A time standard that is not affected by time zones or seasons.
<b>Veer:</b>	1, the wind veers when it shifts in clockwise direction; 2, to pay out anchor cable or rope in a gradual, controlled way.		
<b>Wake:</b>	Waves generated in the water by a moving vessel.		
<b>Watch:</b>	(1) a division of crew into shifts. (2) The time each watch has duty.		
<b>Waterline:</b>	The line where the water comes to on the hull of a boat. Design waterline is where the waterline was designed to be, load waterline is the waterline when the boat is loaded.		
<b>Waterline length (WL):</b>	The length of a boat from stem to stern at the waterline. It governs the maximum speed of displacement hull and effects a boats rating.		
<b>Weather helm:</b>	( Opp. of lee helm).		
<b>Weather side:</b>	The side of a boat on which the wind is blowing.		
<b>Wetted surface:</b>	The area of the hull under water.		
<b>Whip:</b>	To bind the strands of a line with a small cord.		
<b>Whisker pole:</b>	A light pole used to hold out the clew of a headsail when running.		
<b>Winch:</b>	A mechanical device, consisting usually of a metal drum turned by a handle, around which a line is wound to give the crew more purchasing power when hauling taut a line, e.g. a jib sheet.		
<b>Wind scoop:</b>	Funnel used to force wind in a hatch and ventilate the below decks area.		
<b>Windage:</b>	Those parts of a boat that increase drag, e.g., rigging, spars, crew, etc.		
<b>Windlass:</b>	A mechanical device used to pull in cable or chain, such as an anchor rode.		
<b>Windward:</b>	The direction from which the wind blows; towards the wind (opp. of leeward).		
<b>Yaw:</b>	Swinging off course, usually in heavy seas. The bow moves toward one side of the intended course.		